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PHYSICS ABSTRACTS

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THE INSTITUTION OF ELECTRICAL ENGINEERS
IN ASSOCIATION WITH
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ABSTRACTS 1710-2007

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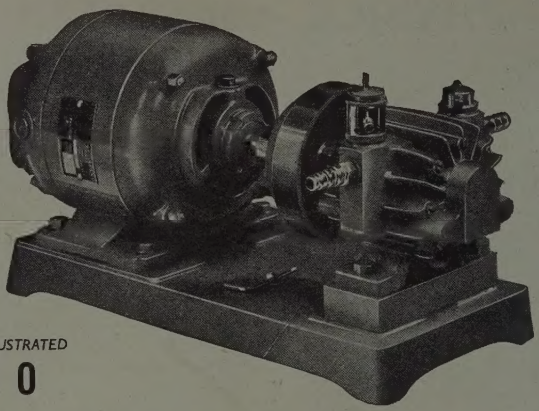

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MATHEMATICS

1710 511.2

Product of two demlo-numbers of the type $(R)N \times (R')N'$ where N and N' are unequal. CHANDRATREYA, M. L., AND KAPREKAR, D. R. *J. Univ. Bombay*, 10, *pp.* 29–34, *Nov.*, 1941.

1711 513.736.36

Unstable minimal surfaces with any rectifiable boundary. SHIFFMAN, M. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 103–108, *March*, 1942.—Let Γ be any rectifiable curve in space. It is proved that Γ must bound unstable minimal surfaces whenever it bounds several minimal surfaces which are relative minima in area.

1712 515.69

Square-ruled paper projection. BOYS, C. V. *J. Sci. Instrum.*, 19, *pp.* 65–71, *May*, 1942.—A method is described for making a projection drawing, from any point of view in which the drawing is set out, directly from the dimensions of the object without the use of intermediate plans and elevations. By the use of square-ruled paper, aided by the slide rule, figures may be drawn in which the dimensions are found by the rulings on the paper only. The last part deals with the solution of the spherical triangles on which the method depends.

1713 517.27

The method of differentials in problems of maxima and minima. MAHAJANI, G. S. *J. Univ. Bombay*, 10, *pp.* 1–8, *Nov.*, 1941.

1714 517.38

A note on Riemann integration. MAHAJANI, G. S. *J. Univ. Bombay*, 10, *pp.* 9–10, *Nov.*, 1941.—Proofs *ab initio* of the evaluation of certain definite integrals are given.

See Abstr. 1766 517.63 : 533.7

See Abstr. 1907 517.925 : 541.127

1715 517.933

Concerning the differential equations of some boundary-layer problems. II. WEYL, H. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 100–102, *March*, 1942.—[See Abstr. 678 (1942)].

1716 517.942.4 : 621.396.611.2

Stability of oscillations in systems obeying Mathieu's equation. BRAINERD, J. G. *J. Franklin Inst.*, 233, *pp.* 135–142, *Feb.*, 1942.—[Abstr. 955 B (1942)].

1717 518.3 : 541.26 : 535.323

Molecular refraction nomograph. DAVIS, D. S. *Industr. Engng Chem.*, 34, *p.* 258, *Feb.*, 1942.

1718 518.4 : 535.338

Application of a calculating board to quantitative spectro-analysis. KING, C. *J. Opt. Soc. Amer.*, 32, *pp.* 112–115, *Feb.*, 1942.

1719 518.5

A special slide rule for calcium carbonate equilibrium problems in corrosion control of water supplies. HIRSCH, A. A. *Industr. Engng Chem. (Analyt. Edit.)*, 14, *pp.* 178–180, *Feb.* 15, 1942.

1720 519.241.6

On confidence intervals. WILSON, E. B. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 88–93, *March*, 1942.—A discussion on std. deviation values.

1721 519.242.36

On contingency tables. WILSON, E. B. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 94–100, *March*, 1942.

1722 519.272

Inherent relations between random variables. GEARY, R. C. *Proc. Roy. Irish Acad. A*, 47, *pp.* 63–76, *March*, 1942.—Deals with the determination of the true functional relations between variables in the measurement of which errors have been made. The linear and non-linear cases are considered in turn.

1723 519.272.14

Certain moment calculations connected with multivariate normal populations. BOSE, P. *Sci. and Cult.*, 7, *pp.* 411–412, *Feb.*, 1942.

1724 519.282

An inverse problem concerning a chain process. OPATOWSKI, I. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 83–88, *March*, 1942.—Deals with the problem of determining the laws governing a process of which only the end conditions are known.

1725 519.413

Maximal Sylow subgroups of a given group. MILLER, G. A. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 80–83, *March*, 1942.

1726 519.53

On homogeneous measure algebras. MAHARAM, D. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 108–111, *March*, 1942.—Deals with the structure of general measure algebra.

ASTRONOMY

1727 523

Mount Wilson Observatory report. ADAMS, W. S. *Carnegie Instn Yearb.*, 40, *pp.* 3–30, 1940–1941.

1728 523.43

Temperature estimates of the planet Mars, 1924 and 1926. COBLENTZ, W. W. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 297–309, *March*, 1942.—The various methods previously employed in deriving temperatures from radiometric measures on Mars are reviewed. Revisions due to the use of different atmospheric transmission curves are negligible where the reduction method employs the law of total radiation of a black body, but are serious where the fluorite-filter method involves the spectral distribution law. The discrepancy can be partly removed by assuming high selective emission at 8–10 μ by silicates on the surface of Mars. A. HU.

1729 523.51 : 621.396.812.5

Whistling meteors—a Doppler effect produced by meteors entering the ionosphere. CHAMANLAL, AND VENKATARAMAN, K. *Electrotechnics, No.* 14, *pp.* 28–40, *Nov.*, 1941.—[Abstr. 963 B (1942)].

1730 523.67

Considerations regarding cometary and interstellar molecules. SWINGS, P. *Astrophys. J.*, 95, *pp.* 270–280, *March*, 1942.—The mechanisms of molecular

formation, dissociation and ionization, are compared in comets and in interstellar space. New identifications demonstrate the presence of CH^+ in comets, and that of OH^+ is suspected. Additional evidence for the presence of the isotopic bands of C_2 is given: the $C^{12}C^{13}$ molecule is observed in 3 transitions. The dissociation equilibrium of CH^+ in interstellar space is discussed; its computed abundance is in agreement with observation. The electron density in the regions of molecular absorption is about 10^{-1} cm.$^{-3}$ The case of CN cannot be fully discussed because its ionization potential is not known. The interstellar lines of C_2 must be much weaker than those of CH, CH^+ and CN. A. HU.

1731 523.75

Chromospheric eruptions observed at Sherborne, 1940. ELLISON, M. A. *Mon. Not. Roy. Astr. Soc.*, 102, 1, *pp.* 22–23, 1942.

1732 523.75

The solar corona. SAHA, M. N. *Nature, Lond.*, 149, *pp.* 524–525, *May* 9, 1942.—Discusses the theory in the light of recent spectroscopic observation.

1733 523.77

Characteristic radial motions of Hα absorption markings seen with bright eruptions on the Sun's disc. NEWTON, H. W. *Mon. Not. Roy. Astr. Soc.*, 102, 1, *pp.* 2–10, 1942.—A spectrohelioscope is used to measure the radial velocity of dark markings associated with chromospheric eruptions. Half the observed cases show a high initial outward velocity followed by a sudden drop, then a const. retardation less than that due to solar gravity. The outward-moving matter disappears before it reaches zero velocity, and simultaneously inward-moving matter appears, dropping with a similar acceleration till it disappears at a velocity of about 80 km./sec. The other cases show a similar overlap of + and − velocities. The markings are identified with "surges" at the limb. A. HU.

1734 523.77

Some studies of the motions of hydrogen flocculi by Doppler displacements of the Hα line. ELLISON, M. A. *Mon. Not. Roy. Astr. Soc.*, 102, 1, *pp.* 11–21, 1942.—Radial-velocity measurements have been made at 1 min. intervals on surges near sunspots and quasi-eruptive flocculi in the vicinity of chromospheric eruptions, all observations being made on the disc. The curves are discussed and distance integrals and accelerations deduced. The distance integrals are in satisfactory agreement with the heights observed for the limb prominences of corresponding type. Accelerations have been found in the initial stages of ascent equal to, and in one case exceeding, the value for free fall under gravity in the chromosphere.

1735 523.77

Short-lived Hα prominences observed on the Sun's disc. HUNTER, A., AND THACKERAY, A. D. *Observatory*, 64, *pp.* 201–206, *April*, 1942.—Correspondence.

See Abstr. 1997 523.78 : 621.396.812.5 : 551.510.535

1736 523.82

Mean absolute magnitudes and space motions of the long-period variable stars. WILSON, R. E., AND MERRILL, P. W. *Astrophys. J.*, 95, *pp.* 248–266, *March*, 1942.—Radial velocities and proper motions of the variables of types M*e* and S*e* are used to determine the mean abs. magnitude $\bar{M}$. For each type as a whole, $\bar{M} = -1{\cdot}0$, but the separate values are correlated both with type and period: they decrease from $-2{\cdot}7$ for M1*e* stars to $+0{\cdot}3$ for M8*e*, and reach a max., $-2{\cdot}7$, for 175-day periods, falling off to $-2{\cdot}2$ at 150 days and $+0{\cdot}6$ at 450 days. Space motions based on parallaxes determined with the aid of this period/luminosity relation show correlations with type and period, the mean speed being 74 km./sec. The motions are reasonably explained on the hypothesis of galactic rotation. A. HU.

1737 523.872

Profiles of hydrogen lines in 2 Class B stars. DOUGLAS, A. V., AND WEST, D. C. *Mon. Not. Roy. Astr. Soc.*, 102, 1, *pp.* 35–39, 1942.—Theoretical line widths computed by Verweij are compared with profiles of certain Balmer lines in spectra of γ Peg and ι Her. Comparison is likewise made regarding total absorption in 5 Balmer lines and an estimate of the temperature of γ Peg is indicated. The percentage absorption at line centre is compared with the observations of other investigators.

1738 523.873

The theory of continuous stellar spectra. WILDT, R. *Observatory*, 64, *pp.* 195–201, *April*, 1942.—A satisfactory theoretical interpretation of the correlation between effective and colour temperatures will depend on a synthesis, not yet realized, between the theory of radiative equilibrium, the study of atmospheric absorption coefficients and relative abundances, and the wave-mechanical theory of the absorption cross-section of individual particles. The observed colour temperatures can be represented fairly well by assuming that the atmospheric opacity of stars between A0 and F0 is due to atoms and negative ions of H. In other stars other sources of opacity must exist. The author suggests that molecular opacity may be of importance: the H_2^+ molecule should be abundant, invisible as regards absorption lines, but capable of absorbing a continuum from ultra-violet to infra-red. A. HU.

1739 523.877

An attempt to interpret the relative abundances of the elements and their isotopes. CHANDRASEKHAR, S., AND HENRICH, L. R. *Astrophys. J.*, 95, *pp.* 288–298, *March*, 1942.—Information is derived concerning the pre-stellar stage of element formation. From the equilibrium between the fundamental nuclear particles at temperatures of 5 to 10×10^9 deg., the rel. concentrations of protons and neutrons are derived as functions of temperature. The theoretical mass-abundance curve for a temperature of 8×10^9 deg. and a density of 10^7 g.cm.$^{-2}$ accounts reasonably for the preponderance of H and He and for the observed abundances from O to S, but not for the existence of heavy nuclei. These are supposed to have originated at an earlier stage of extreme temperatures (10^{10} or 10^{11} deg.) and pressures. A. HU.

1740 529.5

Calendar reform and the National Academy of Sciences. CASTLE, W. E. *Science*, 95, *p.* 195, *Feb.* 20, 1942.

PHYSICS

1741 530.14 = 3

Attempt at a synthesis of wave mechanics and corpuscular mechanics. (Second Paper). PLANCK, M. *Ann. Phys., Lpz.*, 40, 7, *pp.* 481–492, 1941.—In continuation of earlier work [Abstr. 2332 (1940)] it is proved that with the condition fulfilled that $\Psi\nabla \cdot (\nabla\Psi)/|\nabla\Psi|^2 \to 1$ [Abstr. 1729 (1941)] wave mechanics always passes into corpuscular mechanics for $h \to 0$. The force-free electron and the linear harmonic oscillator are also discussed. H. G. S.

1742 530.145

Physical interpretation of quantum mechanics. DIRAC, P. A. M. *Proc. Roy. Soc. A*, 180, *pp.* 1–40, *March* 18, 1942.—The author adopts the standpoint that it is easy to establish the mathematical equations of a relativistic as well as a non-relativistic quantum mechanics but not easy to interpret the mathematical scheme physically. The non-relativistic mechanics of Heisenberg and Schrödinger lead to a physical interpretation, but the same methods applied to the non-relativistic case produce the negative-kinetic-energy and the negative-probability difficulties. It is suggested that the negative-energy difficulty for electrons should be overcome by making calculations for a world almost saturated with positrons and then assuming that the calculations still hold for the physical world. For photons, the difficulty can be overcome by considering the states of positive and negative energy to be associated with the absorption and emission of a photon, respectively, and not with its existence. Three appendices deal respectively with the action principle of classical electrodynamics, an improved method for second quantization and the transformation of the quantum electrodynamics so developed into the electrodynamics of Heisenberg and Pauli. G. C. McV.

1743 531.19

On the calculation of the distribution function. UFFORD, C. W., AND WIGNER, E. P. *Phys. Rev.*, 61, *pp.* 524–527, *April* 1 *and* 15, 1942.—The distribution function for particles confined to a large circle is found for a repulsive potential of long range. The distribution function is calculated from the Boltzmann–Gibbs equation and compared with the solution of an implicit equation of the type used by Debye and Hückel in the theory of electrolytes. The solution of the Debye–Hückel equation agrees, for the particular potential, with the exact distribution function.

See Abstr. 1763 531.19 : 533.15

1744 531.22

The stresses in an incomplete ring subject to uniform shear and compression on its inner surface. NEWING, S. T. *Phil. Mag.*, 33, *pp.* 241–257, *April*, 1942.—The ring is one of 3 quadrants, and is taken as representing a maneton joint subject to stresses from a crank pin. Expressions are derived for the stresses from the theory of generalized plane stress, and the paper deals fully with the evaluation of these and the calculation of tables required for this purpose. Results give the variation of the hoop, radial and shear stresses in the incomplete ring. G. E. A.

1745 531.32

Extended theorems in dynamics. KASNER, E., AND MITTLEMAN, D. *Science*, 95, *pp.* 249–250, *March* 6, 1942.—Discusses trajectories of a particle in a field of force.

1746 531.731.3

Apparatus for precision calibration of pipettes, volumetric flasks and burettes. THOMPSON, W. R. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 268–271, *March* 15, 1942.

1747 531.754.4

Semi-micropycnometer for heavy water. FONTANA, B. J., AND CALVIN, M. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 185–186, *Feb.* 15, 1942.

See Abstr. 1760 531.756 : 532.77

1748 531.756 : 536.63

The densities and specific heats of aqueous solutions of *dl*-α-alanine, β-alanine and lactamide. GUCKER, JR., F. T., AND ALLEN, T. W. *J. Amer. Chem. Soc.*, 64, *pp.* 191–199, *Feb.*, 1942.—The molal heat capacities are linear functions of molality at low conc., and molal volumes are linear functions of molarity.

1749 531.787

Improved manometer design. SMALL, W. G., AND DRAKE, A. F. G. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *p.* 244, *March* 15, 1942.

1750 531.787

Vapour pressures of the tritium liquid hydrogens—dependence of hydrogen vapour pressure on mass of the molecule. LIBBY, W. F., AND BARTER, C. A. *J. Chem. Phys.*, 10, *pp.* 184–186, *March*, 1942.—The const. of Henry's law for HT evaporating from approx. 10^{-9} *M* solutions in normal H_2 and for DT from nD_2 were determined by distillation and measurement of the radio-activities of the distillate gases. The const. were taken to represent the v.p. of pure HT and DT liquids.

See Abstr. 1984 531.787 : 550.43

See Abstr. 1925 532 : 537.363 : 541.18

1751 532.13

Calculation of viscosity from Stormer viscometer data. GEDDES, J. A., AND DAWSON, D. H. *Industr. Engng Chem.*, 34, *pp.* 163–167, *Feb.*, 1942.—To explore the possibility of describing the consistency of paints in more fundamental units, use of the modified Stormer viscometer on truly viscous oils is studied. It is possible to correlate the viscosity of these oils with Stormer data, provided a correction for kinetic-energy losses is made.

1752 532.13

The development of a capillary viscometer to measure viscosities in excess of 10 poises. NISSAN, A. H. *J. Inst. Petrol.*, 28, *pp.* 41–56, *March*, 1942.—An abs. capillary viscometer is described. The liquid is forced through a horizontal straight tube, the pressure drop across the tube, the rate of flow of liquid and the temperature being recorded. The rate of flow is measured by allowing the liquid to flow into a reservoir and noting the rate of flow of the displaced air by means of a calibrated flow-meter. The average value of 20 determinations of the viscosity of an oil did not differ from the N.P.L. value, and the average does not differ by more than 2% from any individual result. A. J. M.

1753 532.13

Viscosity determination of cotton in dimethyl dibenzyl ammonium hydroxide. RUSSELL, W. W.,

AND HOOD, JR., L. N. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 202–205, *March* 15, 1942.

See Abstr. 1761 532.13 : 532.77

1754 532.13 : 541.24

Viscosities of solutions of polyvinyl chloride. MEAD, D. J., WITH FUOSS, R. M. *J. Amer. Chem. Soc.*, 64, *pp.* 277–282, *Feb.*, 1942.—A systematic study of the viscosities of solutions of polyvinyl chloride, in which the effects of temperature, rate of shear, conc., time and solvent were investigated.

1755 532.542

Flow of liquids in the critical region. NISSAU, A. H. *Nature, Lond.*, 149, *pp.* 501–502, *May* 2, 1942.

1756 532.57

Visual-fluid flowmeters with straight-walled tubes. KINTNER, R. C. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 261–264, *March* 15, 1942.—Several variations of a visual-fluid flowmeter are described and calibration data for fluids of varying density and viscosity are given. Accuracies within 1 to 3% were observed.

1757 532.613.4

The direct measurement of the spreading-pressures of volatile organic liquids on water. TRANSUE, L. F., WASHBURN, E. R., AND KAHLER, F. H. *J. Amer. Chem. Soc.*, 64, *pp.* 274–276, *Feb.*, 1942.—The method of direct measurement of the spreading-pressures of volatile liquids involving the use of monomolecular films gives good results for isoamyl chloride, benzene, toluene and acetophenine. The surface tensions and the interfacial tensions of the organic-liquid/water interface for the above liquids were measured. The spreading coeff. were redetermined.

1758 532.62

Time of collapse of a soap bubble. SIBAIYA, L. *Nature, Lond.*, 149, *pp.* 527–528, *May* 9, 1942.

1759 532.73

A kinetic theory of diffusion forces in metabolizing systems. LANDAHL, H. D. *Bull. Math. Biophys.*, 4, *pp.* 15–26, *March*, 1942.—The development of a molecular theory of the diffusion drag forces in liquids is attempted by considering the liquids as limiting cases of very dense gases. An expression is derived for the force on a small particle suspended in a non-uniform mixture of such gases on the basis of kinetic theory. Another expression for the order of magnitude of the force on a larger particle is obtained by introducing certain hydrodynamical considerations. Estimates are made of the volume force on the granules and particles within a typical cell due to the diffusion of metabolites.

See Abstr. 1926 532.73 : 541.18

1760 532.77 : 531.756

The densities of morpholine - water solutions. TRIMBLE, H. M., AND BUSE, A. F. *J. Amer. Chem. Soc.*, 63, *p.* 3236, *Nov.*, 1941.

1761 532.77 : 532.13

Relation between viscosity of solutions and physical properties of high polymers. SIMHA, R. *J. Appl. Phys.*, 13, *pp.* 147–153, *March*, 1942.

See Abstr. 1768 532.77 : 534.213

1762 532.77 : 535.566.2 : 535.324

The magnetic rotation of cerium salts in aqueous solution. WILSON, W. K., MASON, C. M., HICKEY, J. W., AND MACK, J. H. *J. Amer. Chem. Soc.*, 64, *pp.* 412–416, *Feb.*, 1942.—The magnetic rotation and refractive indices of cerous chloride in aqueous solutions were determined over a wide range of temperature and conc. The Verdet const. have a straight-line relationship with conc. and with temperature.

1763 533.15 : 531.19

Flow of energy in thermal transpiration for a Bose–Einstein and a Fermi–Dirac gas. GOGATE, D. V., AND KOTHARI, D. S. *Phys. Rev.*, 61, *pp.* 349–358, *March* 1 *and* 15, 1942.—A theoretical paper. The flow of energy, due to effusion of particles, which occurs when 2 chambers containing an ideal gas at different temperatures are connected through an effusion orifice, is calculated for a relativistic, and a completely non-relativistic gas. Three possible cases are discussed for each gas: (*a*) gas non-degenerate in each chamber, (*b*) gas degenerate in both chambers, (*c*) gas non-degenerate in one and degenerate in the other. Case (*b*) is possible for a Fermi–Dirac gas only. For a non-relativistic classical gas the energy flow is proportional to $n_1 T_1^{\frac{1}{2}}(T_1 - T_2)$ (n_1 is concentration in chamber at temperature T_1). For a Fermi–Dirac gas the flow is slightly less, and for a Bose–Einstein gas it is slightly greater than for a classical gas under the same conditions. For case (*b*) the energy flow is proportional to $n_1^{\frac{4}{3}}(T_1^2 - T_2^2)$ for both relativistic and non-relativistic gases. At given temperatures the energy flow is always greater when the concentrations are such that the gas in both chambers is degenerate than when it is non-degenerate. A. J. M.

1764 533.16

Effect of variable viscosity on boundary layers, with a discussion of drag measurements. BRAINERD, J. G., AND EMMONS, H. W. *J. Appl. Mech.*, 9, A1–A6, *March*, 1942.—In the earlier study [Abstr. 2473 (1941)] the viscosity was assumed const. and the distributions of velocity and temperature were obtained for a wide range of conditions. The present paper shows the velocity and temperature distributions in the boundary layer under various assumed viscosity variations. The method of interpretation of traverse tests of the efficiency and flow coeff. of nozzles or other passages is discussed. The variation of viscosity with temperature does not alter the equilibrium temperature of the plate, and hence the reading of a plate thermometer.

1765 533.16 : 534.37 : 533.6.01

Supersonic absorption and Stokes' viscosity relation. TISZA, L. *Phys. Rev.*, 61, *pp.* 531–536, *April* 1 *and* 15, 1942.—The reduction of the 2 viscosity coeff. to 1 according to Stokes' relation, $2\mu + 3\lambda = 0$, is not justified except for a monatomic gas. The generalization by re-introduction of the second independent viscosity coeff. $\kappa = \frac{2}{3}\mu + \lambda$ makes it possible to develop the phenomenological theory of the absorption and dispersion of sound, in agreement with experiment in complete analogy to the corresponding optical phenomena. The connection of the relaxation theory with classical hydrodynamics can be established and, in the case of polyatomic gases, κ is expressed by the characteristic const. of this theory. The case of liquids is discussed. In polyatomic gases and liquids generally $\kappa \gg \mu$. Other hydrodynamical consequences of the introduction of κ are discussed.

See Abstr. 1765 533.6.01 : 534.37 : 533.16

1766 533.7 : 517.63

Evaluation of functions related to Tait's mean free path. ROSENBERG, P. *Phys. Rev.*, 61, *pp.* 528–530, *April* 1 *and* 15, 1942.

1767 534.133 : 621.396.611.21

Isolation of an ultrasonic crystal radiator from conducting liquids. MCGRATH, J. W., AND KURTZ, A. R. *Rev. Sci. Instrum.*, 13, *pp.* 128–129, *March*, 1942.

1768 534.213 : 532.77

Propagation of supersonic waves in liquid mixtures, and intermolecular forces. I. Alcohols in water. PARSHAD, R. *Indian J. Phys.*, 15, *pp.* 323–336, *Oct.*, 1941.—Measurements for mixtures of alcohols and water give velocity/concentration curves showing max., and compressibility/concentration curves showing min. The theory of molecular force fields is, for the first time, applied to sound problems, and it is shown why compressibilities are always lower than expected in ideal cases. It is assumed that both alcohols and water are associated liquids, but on mixing they destroy each other's association and a random motion and distribution of molecules prevail. Compositions of mixtures for min. compressibilities is calculated and agreement with experiment is found for methyl and ethyl alcohols in water, but in the case of propyl alcohol and water there is a discrepancy of $\sim 10\%$; this is explained theoretically. N. M. B.

See Abstr. 1811 534.22 : 536.63

See Abstr. 1765 534.37 : 533.6.01 : 533.16

1769 534.75

Suggestions for a mathematical biophysics of auditory perception with special reference to the theory of aesthetic ratings of combinations of musical tones. RASHEVSKY, N. *Bull. Math. Biophys.*, 4, *pp.* 27–32, *March*, 1942.—Generalizing the previously studied neurobiophysical schemes, consisting of excitatory and inhibitory elements, a neural mechanism is discussed, which may be involved in the perception of combinations of musical tones. Equations giving the total value of central excitation for a combination of any 2 tones are derived; available observations are discussed in the light of the suggested theory.

1770 534.862.3 : 621.396.625.5

Can sound-on-film supplant the record? CRICKS, R. H. *Electronic Engng*, 14, *pp.* 708–710 *and* 726, *April*, 1942.—[Abstr. 961 B (1942)].

1771 535.215 : 537.24 : 538.61

Photophoresis and its interpretation by electric and magnetic ions. EHRENHAFT, F. *J. Franklin Inst.*, 233, *pp.* 235–256, *March*, 1942.—A summary of work on photophoresis is given. Evidence for the fact that a beam of light induces magnetism in particles is put forward. The magnetism induced by light in particles is unipolar, and so single magnetic poles can exist. The numerical value of the magnetic charge on a particle is about the same as that of the electric charge on a particle of the same size. Colloidal particles coagulate faster in light, and experiments with Te indicate that, in this case at least, crystals grow towards the light. Magnetic ions not created by light have also been obtained. A. J. M.

1772 535.242

A simplified photometer for determining nitrogen dioxide concentrations. HARRIS, L., AND SIEGEL, B. M. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 258–260, *March* 15, 1942.

1773 535.243

Blank and background effect on photographed spectral lines. STROCK, L. W. *J. Opt. Soc. Amer.*, 32, *pp.* 103–111, *Feb.*, 1942.—Discusses the quantitative spectrochemical determination of small amounts of Sr in some Rb-rich minerals. Particular attention is paid to the shape of the spectrochemical calibration curve and to the preparation of synthetic standard mixtures. Unusually high reproducibility is obtained so that it is possible to attempt some quantitative treatment of the blank and background effect on faint spectral lines. A. H.

1774 535.243 : 541.132

Association of ferric ions with chloride, bromide and hydroxyl ions (a spectroscopic study). RABINOWITCH, E., AND STOCKMAYER, W. H. *J. Amer. Chem. Soc.*, 64, *pp.* 335–347, *Feb.*, 1942.

1775 535.3

Reflection-transmission relationships in sheet materials. LAUNER, H. F. *J. Opt. Soc. Amer.*, 32, *pp.* 84–93, *Feb.*, 1942.—Reflectances of transmissive sheets, calculated from the transmissions of 1 and 2 sheets, are compared with reflectances obtained by using the spectrophotometer. The basis for calculation was derived by considering the infinite series of reflections in passing through the two sheets. When transmission values for diffuse incidence are substituted in the expression, the reflectances thus calculated correspond to the conditions of diffuse incidence and diffuse viewing. For clear sheets, with normal incidence, specular reflectance may be calculated. Transmissions of papers were found to be dependent upon the angle of incidence. Reflectances throughout the visible region, measured at 45° from normal incidence, agree closely with those obtained using the spectrophotometer.

See Abstr. 1824, 1825, 1826 535.3 : 537.531

1776 535.312

The far ultra-violet reflectivities of metallic films. BANNING, M. *J. Opt. Soc. Amer.*, 32, *pp.* 98–102, *Feb.*, 1942.—The reflectivities of evaporated films of Al, Cu, Ag and Be, were measured spectrographically in the region 1 200–2 200 Å before the films were exposed to air. Cu reflection was considerably higher before contamination by air than afterwards; the other metals showed no effect. The pronounced min. in Be reflectivity did not occur; this min. is believed due to a thin film of tungsten evaporated over the Be.

See Abstr. 1717 535.323 : 541.26 : 518.3

See Abstr. 1762 535.324 : 535.566.2 : 532.77

See Abstr. 1827 535.33 : 537.531

1777 535.33 : 77.02

Film and plate processing equipment. SCHUCH, J. *J. Opt. Soc. Amer.*, 32, *pp.* 116–118, *Feb.*, 1942.

1778 535.33.03

A cutter for spectroscopic electrodes. HODGE, E. S. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *p.* 260, *March* 15, 1942.

1779 535.338

Raman spectra of acetylenes. VI. 1-butyne, 1-pentyne, 1-hexyne, 3-hexyne, 4-octyne and 1-chloro-1-heptyne. CLEVELAND, F. F., MURRAY, M. J., AND TAUFEN, H. J. *J. Chem. Phys.*, 10, *pp.* 172–176, *March*, 1942.—[See Abstr. 430 (1942)].

1780 535.338

The Raman spectra of the sugars in the solid state and in solution. I. The Raman spectra of α- and β-*d*-glucose. SPEDDING, F. H., AND STAMM, R. F. *J. Chem. Phys.*, 10, *pp.* 176–183, *March*, 1942.—Ultra-violet excitation (Hg λ2 537 Å) was employed. A technique for photographing Raman spectra of crystalline organic powders and solutions with very poor scattering power is described. It consisted of the use of complementary filters of aqueous succinic acid (saturated, 4 mm. thick) and a mercury vapour absorption cell (10 cm. long, 150°C.).

1781 535.338

Quenching and depolarization of resonance radiation by collisions with molecules of a foreign gas. Remarks on papers by Ellett, Olsen and Petersen, and by Olsen. MROZOWSKI, S. *Phys. Rev.*, 61, *pp.* 379–380, *March* 1 *and* 15, 1942.—Correspondence. [See Abstr. 438 (1942)].

1782 535.338

Potential-energy curve of the excited state of KH. ALMY, G. M., AND BEILER, A. C. *Phys. Rev.*, 61, *pp.* 476–481, *April* 1 *and* 15, 1942.—The $^1\Sigma \rightarrow {}^1\Sigma$ spectrum of KH was photographed at large dispersion and the region from 4 150 Å to 4 650 Å was analysed. Previous analyses were verified, although certain discrepancies in molecular const. were removed. A potential curve was constructed for the excited state of KH. The vibrational energy of the upper state of KH was followed to about $\frac{3}{4}$ of the energy of dissociation, farther than in any other alkali hydride. As in LiH, the curve of the excited state crosses the ionic curve (of K^+ and H^-) and dissociates apparently into K(^2P) and H(^2S).

1783 535.338

On a new type of vector coupling in complex spectra. RACAH, G. *Phys. Rev.*, 61, *p.* 537, *April* 1 *and* 15, 1942.—Points out that a type of definite vector coupling is possible, which takes place when the electrostatic interaction is weak compared with the spin-orbit interaction of the parent ion, but is strong compared with the spin coupling of the external electron.

1784 535.338

On the deep configuration of cobalt. RACAH, G. *Phys. Rev.*, 61, *pp.* 537–539, *April* 1 *and* 15, 1942.—[See Abstr. 2975 (1940)].

See Abstr. 1718 535.338 : 518.4

1785 535.338 : 535.371 = 3

On the fluorescence and coupling of electron terms and crystal lattices in aqueous salts of the rare earths. HELLWEGE, K. H. *Ann. Phys., Lpz.*, 40, 7, *pp.* 529–542, 1941.—The spectra of the rare-earth salts containing water of crystallization ($8H_2O$ sulphates of Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er and Tm) are investigated with respect to line width, average term splitting in the crystal field, and intensity of the absorption lines due to superposition of lattice vibrations on electron jumps. All three quantities exhibit a symmetry with a min. at the middle. It follows that the electron-lattice coupling is least in the middle of the series (Eu, Gd, Tb) and increases towards the ends (Pr, Tm). This explains why only the middle rare earths from Sm to Dy fluoresce and the others do not. In accordance with the Pauli principle the rare earths in the periodic system symmetrical to Gd have the same terms, and the lattice coupling should also show this symmetry to Gd. But the symmetry is incomplete, owing to the effect of the steadily increasing number of the charge on the nucleus. The coupling between the $4f^n$ terms and the lattice is caused by the hydrate sheath of the rare-earth ions. H. G. S.

See Abstr. 1828 535.338 : 537.531

See Abstr. 1951 535.338 : 541.65

1786 535.342

Ultra-violet absorption spectra of organic molecules. II. The effect of substituent groups upon the absorption of biphenyl. WILLIAMSON, B., AND RODEBUSH, W. H. *J. Amer. Chem. Soc.*, 63, *pp.* 3018–3025, *Nov.*, 1941.

1787 535.342

The infra-red absorption of $C^{13}O^{16}$ at 4·66 microns. LAGEMANN, R. T. *J. Chem. Phys.*, 10, *pp.* 193–194, *March*, 1942.

1788 535.342

The vibrational structure of electronic transitions for some complex ions. SCHULTZ, M. L. *J. Chem. Phys.*, 10, *p.* 194, *March*, 1942.

1789 535.342

Infra-red absorption spectra of the water molecule in crystals. LYON, W., AND KINSEY, E. L. *Phys. Rev.*, 61, *pp.* 482–489, *April* 1 *and* 15, 1942.—Reports the absorption spectra taken under high resolution and dispersion, produced by water in bound states in crystals, and indicates the modes of vibration. Bands in NaBr . $2H_2O$, extending from 3 to 2 μ, and bands near 2·5 μ in NaI . $2H_2O$ and $BaCl_2$. $2H_2O$, are discussed. The absorption of beryl, mica, topaz and quartz from 2 to 3 μ is studied. It is concluded that bands in beryl, which are similar to bands of water dissolved in CCl_4, are caused by monomeric water or vapour-like molecules in solid solution in the open crystal lattice of beryl. In mica only bound hydroxyl groups are present. The evidence indicates that both bound hydroxyl groups and highly perturbed co-ordinated water exist in topaz. In fused quartz there is evidence for the existence of water in solid solution.

1790 535.342

Resonance broadening of caesium. GREGORY, C. *Phys. Rev.*, 61, *pp.* 465–469, *April* 1 *and* 15, 1942.—The resonance broadening of homogeneous Cs vapour in absorption was studied by means of the contour method. The intensities were obtained by utilizing the astigmatism of the Rowland grating. The pressure of the vapour ranged from 10^{-2} to 17·5 mm. Hg. The half breadth varied linearly with the number of atoms per unit vol. Below 10 mm. Hg the lines exhibited symmetrical broadening according to the "dispersion" formula. At higher pressures indications of a violet and red asymmetry are present for the $^2P_{3/2}$ and $^2P_{1/2}$ components, respectively. A definite band on the red side of the $^2P_{3/2}$ and one on the violet side of the $^2P_{1/2}$ was observed.

1791 535.343.3 : 539.133

Interpretation of the methyl iodide absorption bands near λ2 000. MULLIKEN, R. S., AND TELLER, E. *Phys. Rev.*, 61, *pp.* 283–296, *March* 1 *and* 15, 1942.—The theory of the types and structures of bands in an electronic transition in an axially symmetrical molecule of symmetry C_{3v} is discussed. This is applied to the methyl iodide *B* band system near λ2 000, and it is shown that the 2 types of bands observed (strong and weak bands of pseudo-parallel type, and weak bands looking like perpendicular bands but of abnormally wide spacing) can both be explained. Several molecular const. for the ground and excited extronic states are determined. The m. of i. for rotations around the symmetry axis is about 6% greater in the excited state than in the ground state. The theory of the coupling of spin, orbital angular momentum and molecular vibration for various strengths of spin-orbit coupling, is discussed.

1792 535.343.3 : 539.153

Nature of electronic levels in ultra-violet spectra of hydrogen and alkyl halides. MULLIKEN, R. S. *Phys. Rev.*, 61, *pp.* 277–283, *March* 1 *and* 15, 1942.—On the basis of band structures in the hydrogen halides, and other facts, it is concluded that the excited orbital is of σ type ($s\sigma$?) in the *B*, *C* bands, but of $p\pi$ type in the *D*, *E* bands. For the upper level of the *B* and *C* bands, the coupling changes from nearly *J*, *j*-like in the iodides to predominantly *L*, *S*-like in the chlorides. For the *B*, *C* "satellites" in HCl, a $4p\sigma$ excited orbital is indicated. The *D*, *E* bands show nearly *J*, *j*-like coupling for all halides. The natures of the excited orbitals in the various observed Rydberg series are discussed. The $np\pi$ "non-bonding" orbital in the normal states of the H halides and other diatomic hydrides is probably slightly bonding.

See Abstr. 1785 535.371 : 535.338

1793 535.375 : 621.326.794

The fluorescence of phosphors in the rare gases. FONDA, G. R., AND HUTHSTEINER, H. *J. Opt. Soc. Amer.*, 32, *pp.* 156–160, *March*, 1942.—[Abstr. 920 B (1942)].

See Abstr. 1829 535.4 : 548 : 537.531

See Abstr. 1830 535.4 : 548 : 612 : 537.531

1794 535.411

Systems of interferential devices. RAMSAY, B. P., AND PAULS, F. B. *J. Opt. Soc. Amer.*, 32, *pp.* 78–83, *Feb.*, 1942.—Applies the method previously developed for the study of optical devices [see Abstr. 241 (1941)] to cases in which a number of optical devices are employed in series. Sometimes the order in which the devices are employed is dictated by the use, sometimes it is a matter of convenience rather than of necessity. J. W. T. W.

1795 535.43

Optical properties of diffusing materials. DUNTLEY, S. Q. *J. Opt. Soc. Amer.*, 32, *pp.* 61–70, *Feb.*, 1942.—Continues the earlier work [see Abstr. 3042 (1931)] on the optical properties of diffusely transmitting media and shows that these properties can be adequately described by means of 8 constants, viz. 2 surface reflection factors, 2 absorption factors and 4 scattering coeff. Methods are described for enabling these const. to be determined experimentally. J. W. T. W.

1796 535.434

Absorption of light and heat radiation by small spherical particles. II. Scattering of light by small carbon spheres. RUEDY, R. *Canad. J. Res. A*, 20, *pp.* 25–32, *March*, 1942.—[See Abstr. 107 (1942)]. Spheres of carbon for which $2a/\lambda < 0{\cdot}1$ (a = rad. of particle) scatter the light uniformly in all directions. The intensity of the scattered radiation for any angle is $\propto$ (particle vol.)^2 and $\propto (\lambda)^{-4}$. As $2a/\lambda$ increases from $\frac{1}{4}$ to $\frac{1}{2}$ and greater values, the diffused light collects into a main beam that appears as a continuation of the incident ray and that decreases in width as $2a/\lambda$ increases. Blue light prevails in the scattered radiation. When the size of the particles is unknown, the intensity, distribution and polarization, of the scattered light give an approx. value for the radius.

1797 535.434

Measurement of colour and turbidity in solutions of white granulated sugars. MORSE, E. E., AND MCGINNIS, R. A. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 212–217, *March* 16, 1942.—The transmittancy of a sugar solution containing colour (c) and turbidity (t) is represented by $T = T_c \times T_t$. If measurements are made with light passed by a blue-green filter (g) and a red filter (r), then $T_g = T_{gc} \times T_{gt}$ and $T_r = T_{rc} \times T_{rt}$. A mathematical examination indicates the determination of T_{rc} and T_{gc} between T_{rt} and T_{gt}, from which colour and turbidity indices can be calculated from $I_c = 100\ (1 - T_{gc})$ and $I_t = 100\ (1 - T_{rt})$. Transmittancy measurements are made by means of a Lumetron photo-electric colorimeter, and results for a large number of sugar samples give satisfactory agreement with calculated values. N. M. B.

See Abstr. 1762 535.566.2 : 535.324 : 532.77

See Abstr. 1894 535.566.2 : 541.122

1798 535.6

The colorimetric detection and determination of palladium with compounds containing the *p*-nitrosophenylamino group. OVERHOLSER, L. G., AND YOE, J. H. *J. Amer. Chem. Soc.*, 63, *pp.* 3224–3229, *Nov.*, 1941.

1799 535.733.2

Colour matching and colour blindness. GARNER, W. *J. Soc. Dy. Col., Bradford*, 58, *pp.* 65–71, *April*, 1942.—The paper reviews the factors involved in the comparison of 2 coloured patterns, namely the illumination on the pattern, the quality of the light reflected from the pattern, the physiological processes of vision and psychological factors. Tests for colour blindness are described, including the Garner test, in which a dyed test pattern has to be matched against samples arranged in the form of a colour triangle with red, yellow and blue at the corners. The latter are dyed with dyes that tend to go greener in artificial light, while the test patterns tend to go redder. The test is sufficiently sensitive to detect small differences among foreman dyers of proved ability in colour matching. W. D. W.

1800 535.735

The "purple ring" illusion. IVES, R. L. *J. Opt. Soc. Amer.*, 32, *pp.* 119–120, *Feb.*, 1942.—A brilliant purple ring, concentrically surrounding a rapidly receding brilliant red light, is attributed to after-

image effects, and the factors influencing this spectacular and transitory illusion are briefly outlined.

1801 535.81 : 771.35

Dispersion of optical glass. HERZBERGER, M. *J. Opt. Soc. Amer.*, 32, *pp.* 70–77, *Feb.*, 1942.—The formula for the power of a lens system contains the function $S(\lambda)$ which is independent of the glasses chosen. From an examination of the data on a large number of optical glasses, the author finds that $S(\lambda)$ can be accurately represented by the expression $B(\lambda) + 1 - [(B_1 - B_2)/(A_1 - A_2)]A(\lambda)$ where A and B are given in terms of λ and $A_1 = A(\lambda_1)$, etc., λ_1 and λ_2 being the wavelengths for which the system is achromatized. Thus the secondary spectrum can be found for any system which does not contain quite exceptional glasses. The method of dealing with such exceptions is explained. J. W. T. W.

1802 535.824.3

Phase-contrast microscopy. BURCH, C. R., AND STOCK, J. P. P. *J. Sci. Instrum.*, 19, *pp.* 71–75, *May*, 1942.—A simple method of adapting an ordinary microscope for phase-contrast is described, together with the preparation of a test-slide to check its performance. The method is helpful in studies of the interaction between leucocytes and mobile organisms.

1803 536.244

Diffusion of heat through a rectangular bar and the cooling and insulating effect of fins. I. The steady state. AVRAMI, M., AND LITTLE, J. B. *J. Appl. Phys.*, 13, *pp.* 255–264, *April*, 1942.—Exact solutions for temperature distribution and heat flow through a rectangular fin are derived. Except for the factor of thermal conductivity of the fin material, the cooling effect is a function only of the height/width ratio, β, of the fin, and of a dimensionless relative boundary resistivity, μ, governing the heat loss to the environment. For any value of μ, there is a sharp optimum value of β beyond which further increase in height will not lead to improvement in cooling effect. This optimum β decreases with decreasing μ until, at a certain critical value near 1, it becomes zero. At the critical point, the cooling effect is independent of β, and the presence of the fin is a matter of indifference.

1804 536.33

A model method of photographic and photometric determination of heat radiation between surfaces and through absorbing gases. JAKOB, M., AND HAWKINS, G. A. *J. Appl. Phys.*, 13, *pp.* 246–254, *April*, 1942.—A model, similar to the device under investigation, is constructed. Light is used instead of the long-wave heat radiation, and its absorption by photographic films which cover the surfaces of the model is measured by photometry. The case of gases which absorb heat radiation is imitated by using liquids which absorb light rays. The application to radiation through a non-absorbing medium is shown by experiments on a tube-bank model. The adaptation to heat radiation through absorbing gases is demonstrated by photos of the spectrum of a special combination of light-filter, absorbing liquid and photographic film, which are in tune in a narrow wavelength range.

1805 536.421

The freezing point of phenothiazine. SMITH, L. E., AND NELSON, O. A. *J. Amer. Chem. Soc.*, 64, *pp.* 461–462, *Feb.*, 1942.

1806 536.421

A new medium for m.p. baths. KAMLET, J. *Science*, 95, *p.* 308, *March* 20, 1942.

1807 536.421.1 : 536.652

Anhydrous sodium soaps. Heats of transition and classification of the phases. VOLD, R. D. *J. Amer. Chem. Soc.*, 63, *pp.* 2915–2924, *Nov.*, 1941.—A differential calorimeter was devised suitable for determination of heats of transition and transition temperatures up to 340°. These were determined for the series of phases occurring between true crystal and true liquid for sodium laurate, myristate, palmitate, stearate and oleate. At the transitions from curd-fibre phase to sub-waxy soap and from sub-waxy to waxy soap the heat effect is large and varies with the chain length. At the higher-temperature transitions the heat effect is small and relatively independent of the chain length. The low-temperature transitions are probably due to changes in the arrangement of the hydrocarbon chains while the high-temperature transitions are due to rearrangement of the polar heads of the molecules.

1808 536.5 : 669.18 : 621.365

The temperature distribution in the liquid steel in various steelmaking furnaces. OLIVER, D. A., AND LAND, T. *J. Iron Steel Inst.*, [15 *pp.*], 1942. *Advance copy.*—[Abstr. 933 B (1942)].

1809 536.6.081 : 9

History of the British Thermal Unit. POWELL, R. W. *Nature, Lond.*, 149, *pp.* 525–526, *May* 9, 1942.

1810 536.621

A modified calorimeter for high temperatures. The heat content of silica, wollastonite and thorium dioxide above 25°. SOUTHARD, J. C. *J. Amer. Chem. Soc.*, 63, *pp.* 3142–3146, *Nov.*, 1941.—A calorimeter for high-temperature sp. ht. has been constructed which possesses improved ease of manipulation and gives results that agree with the best previous work.

See Abstr. 1748 536.63 : 531.756

1811 536.63 : 534.22

Supersonic measurement of the heat capacity of propylene. TELFAIR, D. *J. Chem. Phys.*, 10, *pp.* 167–171, *March*, 1942.—An apparatus designed for (1) a general study of acoustical dispersion in gases, and (2) measurement of gaseous heat capacities, has been used to measure the heat capacity of propylene between 273° and 490°K. The methods are outlined and discussed. The measured values agree with those calculated from the frequency assignment.

1812 536.65

The thermodynamic constants of the dithionite (hydrosulphite) ion. MCMILLAN, JR., W. G., ROBERTS, J. D., AND CORYELL, C. D. *J. Amer. Chem. Soc.*, 64, *pp.* 398–399, *Feb.*, 1942.

1813 536.652

The thermal properties of crystalline and glassy boron trioxide. SOUTHARD, J. C. *J. Amer. Chem. Soc.*, 63, *pp.* 3147–3150, *Nov.*, 1941.—The heat of fusion and the heat content above room temperatures were determined.

See Abstr. 1807 536.652 : 536.421.1

1814 536.7 : 551.57

The thermodynamic properties of water and water vapour. KIEFER, P. J. *Mon. Weath. Rev., Wash.*,

69, *pp.* 329–331, *Nov.*, 1941.—On the basis of the tables of the thermodynamic properties of steam prepared by Keenan and Keyes, a table suitable for meteorologists is given covering the range − 40° to 50° C. The entries included are the saturated v.p. (mb.) and saturated vapour densities (g./m.^{3}) over both water and ice, the enthalpy (joules/g.) and entropy (joules/g.°K) of saturated liquid or ice and of saturated vapour, and the associated changes of enthalpy and of entropy for evaporation or sublimation. The enthalpy and entropy values are given rel. to arbitrarily assigned values of zero for ice at − 73°C. R. W. P.

1815 536.71

P–V–T relations and derived quantities for hexanes. Kelso, E. A., and Felsing, W. A. *Industr. Engng Chem.*, 34, *pp.* 161–163, *Feb.*, 1942.

See Abstr. 1860 536.71 : 539.155.2

See Abstr. 1936 536.75 : 541.183.1

1816 536.763

Pressure-temperature chart for vapours. Hirsch, M. *Industr. Engng Chem.*, 34, *pp.* 174–182, *Feb.*, 1942.

1817 536.782

The Joule–Thomson effect in carbon dioxide. Roebuck, J. R., Murrell, T. A., and Miller, E. E. *J. Amer. Chem. Soc.*, 64, *pp.* 400–411, *Feb.*, 1942.—[See Abstr. 2825 (1940), 1684, 2085 (1938)]. A large group of isenthalpic curves lying between − 55° and 300° and between 1 and 200 atm. were measured with CO_2. Special care has been given to the region in the neighbourhood of the v.p. curve and the critical state. The Joule–Thomson coeff. is calculated for the whole field and tabulated as a function of the temperature at a series of const. pressures. The inversion curve in the liquid region was located, as well as the contact point of a particular isenthalp with the v.p. curve.

1818 537.221

Theory of electrical contact between solids. Fan, H. Y. *Phys. Rev.*, 61, *pp.* 365–371, *March* 1 *and* 15, 1942.—The phenomena of electrical contact are examined in detail. The difference between the behaviours of metals and semi-conductors is pointed out. It is shown that the density of conduction electrons in a semi-conductor can be expected to change appreciably from its normal value which may be important for the explanation of certain phenomena.

1819 537.226 : 621.3.011.5 : 621.3.018.14 : 621.315.616

Dielectric constant, power factor and conductivity, of the system rubber–calcium-carbonate. Scott, A. H., and McPherson, A. T. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 279–296, *March*, 1942.—[Abstr. 893 B (1942)].

1820 537.226.1 = 3

Dielectric behaviour of inhomogeneous substances, especially biological bodies, at different temperatures and frequencies. Schwan, H. *Ann. Phys., Lpz.*, 40, 7, *pp.* 509–528, 1941.—The purport of the investigation is to show how far it is possible to decide between the Debye theory of polar molecules and the Maxwell–Wagner theory of charging currents in the dielectric due to inhomogeneities in order to explain the mechanism of conduction in biological media, particularly the observed wavelength dependence of the electrical const., from determinations of the temperature dependence of dielectric const., ε, and conductivity, σ, at various wavelengths. The discussion covers a comparison of the Wagner–Dänzer and Debye theories, the temperature dependence of ε_0, ε_∞, T and σ, the dependence of the conductivity and dielectric const. in the presence of inhomogeneous effects, and with polar effects present, and includes a series of curves and tables of values. For blood it is shown that the dielectric const. behaviour differs widely according to both theories. With layer effects present the temperature coeff. of ε must always be +; on the other hand, temperature regions exist for which it is − on the assumption of polar molecules. Simple rules are formulated relating to conductivity and dispersivity, the quantitative confirmation of which would be in favour of the presence of inhomogeneous effects. A criterion is also possible without changing the temperature: with inhomogeneous effects present the dispersion wavelength does not change with the number of the blood corpuscles; but with polar effects present a dependence is to be expected. H. G. S.

See Abstr. 1956 537.226.1 : 541.67 : 621.315.616.96

1821 537.226.2 : 541.452

The effect of substituents on the acid strength of benzoic acid. V. In *n*-propyl alcohol. Elliott, J. H. *J. Phys. Chem.*, 46, *pp.* 221–227, *Feb.*, 1942.—The values of the acid strength of 23 mono-substituted benzoic acids relative to benzoic acid have been determined in the solvent *n*-propyl alcohol by a potentiometric method. For pure solvents having dielectric const. $< 24{\cdot}2$, $\log K_{A_xB_0}$ is not linear in the reciprocal of the dielectric const. of the solvent.

1822 537.226.2 : 621.385.33.028

On the h.f. conductivity and effective dielectric const. of electronic medium in a (high-vacuum) thermionic valve. Basak, R. G. *Indian J. Phys.*, 15, *pp.* 343–358, *Oct.*, 1941.—[Abstr. 939 B (1942)].

See Abstr. 1771 537.24 : 538.61 : 535.215

1823 537.312 = 3

The change in the pressure coefficient of metallic resistance with temperature. Grüneisen, E. *Ann. Phys., Lpz.*, 40, 7, *pp.* 543–552, 1941.—A quantitative proof is given of the increase, numerically, of the pressure coeff. of the electrical resistance of a pure metal from a const. negative value at high temperature ($T \gg \Theta$) to a const. negative one at low temperature ($T \ll \Theta$), where T is the abs. temperature and Θ the Debye characteristic temperature. In the case of a metal with residual resistance a reduction in this increase is to be expected, and even a numerical decrease of the pressure coeff. when the residual resistance is sufficiently high. H. G. S.

See Abstr. 1925 537.363 : 532 : 541.18

1824 537.531 : 535.3

Diffuse reflection of X-rays by anisotropic and isotropic solids. Jahn, H. A., and Lonsdale, K. *Phys. Rev.*, 61, *pp.* 375–376, *March* 1 *and* 15, 1942.

1825 537.531 : 535.3

On the theory of temperature diffuse scattering. BORN, M. *Phys. Rev.*, 61, *pp.* 377–378, *March* 1 *and* 15, 1942.—Correspondence [Abstr. 487 (1942)].

1826 537.531 : 535.3

The *K*-absorption edges of metal ions in aqueous solution. BEEMAN, W. W., AND BEARDEN, J. A. *Phys. Rev.*, 61, *pp.* 455–458, *April* 1 *and* 15, 1942.—The X-ray *K*-absorption edges of Ni++, Cu++, Zn++, $Cu(NH_3)_4^{++}$ and $Cu_2(CN)_4^{--}$ in aqueous solution have been measured with a double-crystal spectrometer. Ni++, Cu++ and Zn++, have similar edges. Each consists of 2 absorption max. which arise from the excitation of *K* electrons into the empty 4*p* and 5*p* levels of the ion. The final levels are broadened by the fields of the co-ordinated water molecules. Different edge structures were found in the complex ions.

1827 537.531 : 535.33

X-ray *L*-series satellite lines. PINCHERLE, L. *Phys. Rev.*, 61, *pp.* 225–233, *March* 1 *and* 15, 1942.—[See Abstr. 2163 (1940)]. A theoretical treatment is given of the $L\alpha$ and $L\beta$ X-ray satellite lines. The satellites are assumed to arise from doubly ionized atoms, and calculations of wavelength positions and of rel. intensities are made on the method of the self-consistent field. Comparison of computed and observed satellite profile structure is made. A classification of reported experimental component lines is proposed in terms of theoretical transitions.

1828 537.531 : 535.338

The Auger effect in relative intensities and widths of X-ray lines. COOPER, J. N. *Phys. Rev.*, 61, *pp.* 234–242, *March* 1 *and* 15, 1942.—A systematic study of the widths and rel. intensities of *L* lines in the atomic-number range $70 \leq Z \leq 81$ has been made with a 2-crystal spectrometer. In going from Ta (73) to Tl (81) the width of lines arising from L_I initial states increased in energy by approx. 6 eV, while the widths of lines arising from L_{II} and L_{III} initial states increased by approx. 1 eV. The intensities of L_I lines rel. to the intensities of L_{II} and L_{III} lines decrease with atomic number. Both of these variations can be attributed to the increase with atomic number of the probabilities of the Auger transitions $L_I \rightarrow L_{III}M_{IV}$ and $L_I \rightarrow L_{III}M_V$.

1829 537.531 : 535.4 : 548

X-ray interference in partially ordered layer lattices. HENDRICKS, S., AND TELLER, E. *J. Chem. Phys.*, 10, *pp.* 147–167, *March*, 1942.—The X-ray interference is calculated for layer lattices in which the phase shifts between consecutive layers and the scattering powers of individual layers do not follow a strictly periodic arrangement. The general theory is applied to a specific partially ordered stacking of layers encountered in micas and other similar minerals. Irregularities in close packed structures of spheres and irregular sequences of layers in graphite are treated.

1830 537.531 : 535.4 : 548 : 612

X-ray analysis of haemoglobin. PERUTZ, M. F. *Nature, Lond.*, 149, *pp.* 491–494, *May* 2, 1942.—Single crystals of horse haemoglobin are examined at various stages of hydration between the wet and air-dried. The dimensions of the unit cell, which is monoclinic—space group C2—and contains 2 molecules, shrink continuously as the crystals dry out, the *c* spacing being the most affected and the *b* remaining const. It is concluded from X-ray and optical data that the molecules are linked together along the *b*-axis and that the dia. of the molecule in this direction is 64 Å—the length of this axis. The molecule consists either of 2 sheets of protein, each of 18 Å thickness, with a layer of water and possibly salt in between, or of a single rigid sheet of 36 Å thickness. The molecule of dried haemoglobin is a platelet 36 Å thick. It is 64 Å long in the direction of the *b*-axis and somewhat longer along *a*. Elongated ellipsoids of axial ratios 1 : 4 or 1 : 5 which have previously been proposed are incompatible with the crystal structure. J. T.

1831 537.533 : 537.581

Electron emission of metals in electric fields. III. The transition from thermionic to cold emission. GUTH, E., AND MULLIN, C. J. *Phys. Rev.*, 61, *pp.* 339–348, *March* 1 *and* 15, 1942.—The theory of Schottky emission is extended to include electrons which tunnel through the top of the potential barrier at the metal surface when strong electric fields are used. These electrons contribute to the periodic deviations from the Schottky line, increasing the amplitude of the deviations, giving better agreement with experiment. Expressions are developed for the electron current emitted by a metal for various field intensities, from the small fields of thermionics to cold emission. Results are obtained to indicate the temperature and field dependence of the current. Of particular interest is the transition region, i.e. $T \sim 500°$–$1\,200°$K. and $F \sim 10^7$–10^8 V/cm.

1832 537.533.1 : 621.385

Space-charge effects in velocity-modulated electron beams. FUCHS, W. H. J., AND KOMPFNER, R. *Proc. Phys. Soc., Lond.*, 54, *pp.* 135–150, *March*, 1942.—Two types of velocity-modulated electron beams are considered. In the first, the electrons move in a drift-space enclosed by parallel planes having equal potential and screening the beam from the rest of the space, the acceleration of the electrons being due entirely to space-charge forces. This model is used to discuss the working of velocity-modulated h.f. amplifiers. The main conclusion is that the beam of electrons operates in the same manner as if the space-charge were absent, except that the mean transit time is altered. The second model beam, called the "domain" model, underestimates the effects of space charge. A domain may be regarded as a thin slice of beam which moves under the influence of its own initial distribution of charge and velocity, the effects of neighbouring domains and of the boundaries being neglected. Discussion of this model shows that bunching and compression of the electron beam may occur, and the conditions for these effects are deduced. A. W.

See Abstr. 1874 537.533.73 : 548 : 539.23

1833 537.533.74

The multiple scattering of fast electrons. KULCHITSKY, L. A., AND LATYSHEV, G. D. *Phys. Rev.*, 61, *pp.* 254–265, *March* 1 *and* 15, 1942.—The method and apparatus are described. The scattering of electrons of 2·25 eMV is studied in the foils of Al, Cu, Fe, Mo, Ag, Sn, Ta, Au and Pb. The results are com-

pared with theory. For heavy elements the exp. values are 10 to 13% lower than calculated.

1834 537.534.74

The angular distribution of protons scattered by high-energy neutrons. TATEL, H. *Phys. Rev.*, 61, *pp.* 450–454, *April* 1 *and* 15, 1942.—The scattering of 11 eMV neutrons by protons was investigated. The neutrons from the disintegration of a Be target are collimated by a hole in a protective water wall. They are then scattered in a H gas cell and the recoil protons are observed at 2 different angles. The detection system consists of 2 parallel-plate ionization chambers arranged so that protons may pass through both. The intensity of the protons varies as the cosine of the scattering angle.

1835 537.58

Thermionic properties of the iron group. WAHLIN, H. B. *Phys. Rev.*, 61, *pp.* 509–512, *April* 1 *and* 15, 1942.—The temperature scales for Fe, Ni and Co, have been determined for vacuum-heat-treated specimens. The thermionic work functions differ from those reported by others, and are: β-Fe 4·48 eV, γ-Fe 4·23 eV, Ni 4·61 eV and Co 4·40 eV. The probable cause for the difference is discussed and the effect of minute quantities of certain impurities is described.

1836 537.58

The temperature scale, thermionics and thermatomics of tantalum. FISKE, M. D. *Phys. Rev.*, 61, *pp.* 513–519, *April* 1 *and* 15, 1942.—Thermionic measurements of the electron work function and of the positive-ion function yielded, respectively, $\phi_o^- = 4{\cdot}19$ eV and $\phi_o^+ = 10{\cdot}0$ eV, with an electron emission constant $= 55$ A cm.$^{-2}$ deg^{-2}. The work function of the neutral Ta atom was $\phi_o^o = 7{\cdot}97$ eV. The ionization potential of Ta may be estimated to be about 7·3 eV. These values fail to close the energy cycle $\phi_o^- + \phi_o^+ = \phi_o^o + V$ by 1·1 eV, which is outside the experimental uncertainty.

See Abstr. 1831 537.581 : 537.533

1837 537.591

Committee on co-ordination of cosmic-ray investigations. *Carnegie Instn Yearb.*, 40, *pp.* 117–145, 1940–1941.—Progress report for the period July, 1940, to June, 1941.

1838 537.591.1

The mesotron component of cosmic rays. RATHGEBER, H. D. *Phys. Rev.*, 61, *pp.* 207–211, *March* 1 *and* 15, 1942.—From experimental and theoretical results a qualitative picture of the mesotron component is evolved. The intensity, the production, the decay-coefficient of the mesotrons in the whole atmosphere, as well as the origin of the mesotrons at sea level, are obtained in the form of curves. This gives a satisfactory interpretation of the anomalous absorption, the atmospheric effects and the latitude effect at sea level.

1839 537.591.1

Cloud-chamber track of a mesotron stopped by gas. JOHNSON, T. H., AND SHUTT, R. P. *Phys. Rev.*, 61, *pp.* 380–381, *March* 1 *and* 15, 1942.—[See Abstr. 1332 (1942)].

1840 537.591.1

A hypothesis as to the origin of cosmic rays and its experimental testing in India and elsewhere. MILLIKAN, R. A., NEHER, H. V., AND PICKERING, W. H. *Phys. Rev.*, 61, *pp.* 397–407, *April* 1 *and* 15, 1942.—The hypothesis makes possible the prediction of 5 definite cosmic-ray bands, each of which should reach the earth in a particular latitude, and of 4 plateaus of unchanging intensity, these plateaus being delimited by the latitudes of entrance of the successive bands. The bands are designated as (1) a Si band, (2) an O-N band, (3) a C band, and (4) a He band. All of these bands are found in the predicted latitudes and of right order of intensities.

1841 537.591.2

Cosmic-ray electrons of low energy in the atmosphere. ROSSI, B., AND KLAPMAN, S. J. *Phys. Rev.*, 61, *pp.* 414–421, *April* 1 *and* 15, 1942.—The track length of shower electrons above 10^7 eV energy in air is calculated as a function of the primary energy, for both electron- and photon-initiated showers. The results are used to evaluate the number of electrons of energy $> 10^7$ eV, arising from collision processes and from disintegration of mesotrons.

1842 537.591.5

The intensities of the hard and soft components of cosmic rays as functions of altitude and zenith angle. GREISEN, K. *Phys. Rev.*, 61, *pp.* 212–222, *March* 1 *and* 15, 1942.—The intensities were recorded by a coincidence method as a function of zenith angle, at elevations 259, 1 616, 3 240 and 4 300 m., and the possible errors were studied. The abs. directional as well as the integrated intensities at the various elevations are calculated. The nature of the variation of the hard comp. with zenith angle and altitude suggests appreciable production of mesotrons at low altitude.

1843 537.591.5

Mesotron studies with dual telescope. BENEDETTO, F. A., ALTMANN, G. O., AND HESS, V. F. *Phys. Rev.*, 61, *pp.* 266–269, *March* 1 *and* 15, 1942.—A description of the telescope is given. Continual check on operation is obtained by const. ratio of counts of upper to lower telescope within the natural statistical fluctuations. Correlations have been made between mesotron intensity and mass temperature of various fractions up to 0·2 of the daily atmosphere; air data being obtained by sounding-balloon flights. Temperature coeff. from 0·37% to (0·46 ± 0·03)% per deg. C. were obtained. The temperature coeff. varies as dz/dT when increasing fractions are taken. Correlations have also been made for the same mesotron intensities with change of height of 2 levels of the daily atmosphere. The assumption that mesotrons are produced throughout the atmosphere according to the distribution of the air mass leads to a mean rest lifetime rather smaller than that obtained by other methods.

1844 537.591.5

Results of a high-altitude cosmic-ray survey near the magnetic equator. NEHER, H. V., AND PICKERING, W. H. *Phys. Rev.*, 61, *pp.* 407–413, *April* 1 *and* 15, 1942.—Electroscope and Geiger-counter observations have been taken with free balloons at geo-magn. lat. of 3°, 17° and 25° N. The counter technique with a single counter will give results close to those obtained with the electroscope and of comparable accuracy. Vertical-coincidence measurements give rise to different values for the rel. amounts of incident energy

at various latitudes, as compared with the electroscope or single-counter data. No difference was obtained between the vertical-coincidence curves at 3° and 17°, and thus no new energy lies in the primary energy spectrum between the limits of 17 and 15 eBV. This is direct evidence for a banded structure in the primary spectrum. Showers do not affect the vertical-coincidence measurements.

1845 537.591.6

The production of neutrons and protons by the cosmic radiation at 14 125 ft. KORFF, S. A., AND CLARKE, E. T. *Phys. Rev.*, 61, *pp.* 422–426, *April* 1 *and* 15, 1942.—Neutrons were studied with counters filled with BF_3 and Cd absorbers. The neutron counter was surrounded by water, so that nearly all neutrons should be slow, and nearly all produced in the water. Protons were observed in counters filled with CH_4. The size distribution of ionizing events was determined. Coincidences between neutron counts and shower counts were observed, suggesting a connection between the neutrons and the soft component. Estimates are given of the rates of production in various substances, these being of the order of 10^{-3} to 10^{-4} g./sec. on Mt. Evans.

1846 537.79 : 621.3.011.2 = 3

On dependence of the specific resistance of Pt on the diameter of the wire. MOSER, E. *Ann. Phys., Lpz.*, 40, 2, *pp.* 121–130, 1941.—[Abstr. 868 B (1942)].

See Abstr. 1771 538.61 : 537.24 : 535.215

See Abstr. 1931 538.613 : 541.182.63

1847 538.615

Zeeman effects in the arc spectrum of nickel. LINDSLEY, C. H. *J. Opt. Soc. Amer.*, 32, *pp.* 94–97, *Feb.*, 1942. —Zeeman data for 171 Ni I lines are given, based on measurements of patterns photographed in magnetic fields of 85 700 and 81 300 gauss; g values are determined for the even energy levels arising from the $3d^84s^2$ and $3d^94s$ configurations, and for most of the odd levels arising from the $3d^84s4p$ and $3d^94p$ configurations.

1848 538.711

A simple apparatus for the determination of the horizontal component of the earth's magnetic field. RENDALL, G. R. *Sci. and Cult.*, 7, *pp.* 409–410, *Feb.*, 1942.—Describes a deflection apparatus based on Schuster's method.

1849 539.13

On centres of van der Waals attraction. LONDON, F. *J. Phys. Chem.*, 46, *pp.* 305–316, *Feb.*, 1942.—The theory of intermolecular attraction is extended to anisotropic force centres and to molecules containing extended electronic oscillators (charge-transfer spectra). Possible applications of the resulting long-range forces to macromolecular systems are briefly discussed.

1850 539.132

The formation and structure of some organic molecular compounds. WEISS, J. *J. Chem. Soc.*, *pp.* 245–252, *April*, 1942.—The formation of the deeply coloured molecular compounds from quinones and nitro-compounds, on the one hand, and certain unsaturated hydrocarbons and their derivatives, on the other, is ascribed to a complex molecule, essentially ionic in character, which is formed from the two components by an electron transfer from the unsaturated hydrocarbon or its derivative to the quinone or polynitro-compound. A brief quantum-mechanical discussion of this process is put forward.

1851 539.132

The vibration-rotation energies of polyatomic molecules. NIELSEN, H. H. *Phys. Rev.*, 61, *p.* 540, *April* 1 *and* 15, 1942.—Errata. [Abstr. 831 (1942)].

1852 539.133

Dipole moment and molecular structure. Part I. PHALNIKAR, N. L., BHIDE, B. V., AND NARGUND, K. S. **Part II.** BHATKHANDE, A. H., PHALNIKAR, N. L., AND BHIDE, B. V. *J. Univ. Bombay*, 10, *pp.* 48–55, *Nov.*, 1941.—The study of the moments of ethyl esters of phenyl-substituted acetic, malonic and glutaric acids shows that the effect of the phenyl group on the moments of acetates and glutarates is negligible, but there is a definite small inductive effect of the phenyl group on the moments of phenyl-substituted malonates. The esters of *p*-substituted benzoic acids are also discussed.

See Abstr. 1791 539.133 : 535.343.3

See Abstr. 1942 539.133 : 541.571

1853 539.152

On the triplets of helium. INGLIS, D. R. *Phys. Rev.*, 61, *pp.* 297–302, *March* 1 *and* 15, 1942.—The inversion of the He triplets and their deviation from interval rule are due to the spin-other-orbit and to the magnetic spin-spin interactions, respectively, which may be neglected in comparison with the spin-orbit interaction in treating the spectra of heavy elements. The preliminary calculation of Heisenberg is compared with the correct calculation of Breit for the lowest triplet. The extension to higher triplets is simplified and generalized, and the comparison with experiment is discussed.

1854 539.152.2

The nuclear spin and magnetic moment of K^{40}. ZACHARIAS, J. R. *Phys. Rev.*, 61, *pp.* 270–276, *March* 1 *and* 15, 1942.—The molecular-beam magnetic-resonance method was employed to observe the nuclear spin and the h.f.s. $\Delta\nu$ of K^{40}. The apparatus and procedures are different from those previously employed because of the small natural abundance of K^{40} and because the nuclear spin and h.f.s. $\Delta\nu$ were previously unknown. The spin is 4 and the h.f.s. $\Delta\nu = 1\,285{\cdot}70 \pm 0{\cdot}1$ Mc./s. The doublet is inverted. By comparison with the known nuclear moment of K^{39}, the nuclear moment of K^{40} is taken to be $-1{\cdot}290$ nuclear magnetons.

1855 539.152.2

Radio-frequency spectrum of indium. Nuclear spin of In^{113}. HARDY, T. C., AND MILLMAN, S. *Phys. Rev.*, 61, *pp.* 459–465, *April* 1 *and* 15, 1942.—The r.f. spectrum of the ground state of the In atom was studied with the object of obtaining an experimental determination of the nuclear spin of In^{113}. The experiments also yield a determination of the sign of the moment of In^{113}, an improved measurement of the nuclear magnetic moment of In^{115}, as well as a precise determination of the $\Delta\nu$'s of the ground states of these isotopes, and a precise result for the ratio of the magnetic moments of the 2 nuclei.

1856 539.153

Term formulae for the configuration d^5. LAPORTE, O. *Phys. Rev.*, 61, *pp.* 302–304, *March* 1 *and* 15, 1942.—Term formulae for a configuration of 5 equivalent d electrons are given. Although several terms appear more than once ($2\,{}^2Gm$ $2\,{}^2F$, $3\,{}^2D$), and are therefore expected to depend irrationally upon the radial integrals, this is only so for 2 out of the $3\,{}^2D$ terms. For the other terms the secular equation possesses roots linear in the radial integrals. The formulae represent satisfactorily the d^5 terms of Cr II.

1857 539.153

Degeneracies among terms of a configuration of equivalent electrons. LAPORTE, O., AND PLATT, J. R. *Phys. Rev.*, 61, *pp.* 305–308, *March* 1 *and* 15, 1942.—If the radial integrals occurring in the term formulae for a configuration l^z assume certain integer ratios, all elements of the energy matrix become low multiples of a common value. As a consequence, high degeneracies occur. The reason for this is proved to be the existence of an identity concerning sums of products of 3 integrals of spherical harmonics. The regularity may serve in the approx. allocation of energy levels or as a check for exact energy formulae.

1858 539.153

Nuclear levels of the compound Li_5. BECK, G., AND TSIEN SAN-TSIANG. *Phys. Rev.*, 61, *p.* 379, *March* 1 *and* 15, 1942.

See Abstr. 1792 539.153 : 535.343.3

1859 539.155.2

The radioactive isotopes of nickel and their assignments. NELSON, M. E., POOL, M. L., AND KURBATOV, J. D. *Phys. Rev.*, 61, *pp.* 428–431, *April* 1 *and* 15, 1942.—The following reactions were investigated: Fe(α, n), Co(d, $2n$), Ni(d, p), Ni(n, α), and Ni(n, $2n$). The results agree with the assignment of the 2·6 hr. period to Ni^{63} and the 36 hr. period to Ni^{57}. The possible existence of a short period in Ni, reported as a result of an Fe(α, n) reaction, is not established. In the attempted separation of the O^{15} activity it was observed that, under the prevailing experimental conditions, the rate of removal of O from bombarded Fe approached the rate of decay of O^{15}.

1860 539.155.2 : 536.71 = 3

The energy consumed in the separation of isotopes. HAUTERMANS, F. G. *Ann. Phys., Lpz.*, 40, 7, *pp.* 493–508, 1941.—The energy consumed in the different methods of isotope separation is analysed on the basis of existing data and compared with the energy of separation required thermodynamically. A summary is given of the energy consumption per mol of the product isolated, in both kWh/mol and eV, the ratio of the product to the main isotope at the start and finish of the process, V_o and V_e, the separation factor, q, the reversible work of separation in RT units and the thermodynamic efficiency for $t = 300°K.$ for a series of isotopes (D^2, Ne^{20}, Ne^{22}, Ar^{36}, Ar^{38}, Cl^{35}, Cl^{37}, C^{13}, Cl_2^{37}) and a number of processes (h.f., Clusius–Dickel tube, etc.), as well as in a few cases the work of compression in eV for repeated fractional distillation for the same V_o, V_e and q. H. G. S.

1861 539.16.08

Temperature coefficients in self-quenching counters. KORFF, S. A., SPATZ, W. D. B., AND HILBERRY, N. *Rev. Sci. Instrum.*, 13, *p.* 127, *March*, 1942.

1862 539.16.08

A portable Geiger–Müller counter. TAFT, R. B. *Radiology*, 38, *pp.* 350–352, *March*, 1942.—[See Abstr. 1109 (1940)].

1863 539.16.08

Proportional counter amplification at low voltages. ROSE, M. E., AND RAMSEY, W. E. *Phys. Rev.*, 61, *pp.* 504–509, *April* 1 *and* 15, 1942.—[See Abstr. 1607 (1942)]. The investigation of gas amplification in proportional counters has been extended to low voltages where the transition to ionization-chamber behaviour is observed. In order to avoid field distortion due to positive-ion space charge, it is necessary to use a weak source of radiation. This necessitates measurement of ionization currents of order 10^{-14} A at low gas amplification. A counter has been designed, capable of measuring such currents without amplification. The l.v. gas amplification in polyatomic and simpler mixtures is qualitatively the same. At l.v. where amplification sets in, the fluctuations in energy loss of the electrons initiating avalanches plays an important rôle.

1864 539.163 : 551.462

Radioactivity of ocean sediments. V. Concentrations of the radio-elements and their significance in red clay. URRY, W. D., AND PIGGOT, C. S. *Amer. J. Sci.*, 240, *pp.* 93–103, *Feb.*, 1942.—The relationship between the radio-elements in "Red clay" is similar to that previously described [Abstr. 1116 (1942)]. The red clay is distinguished from the calcareous sediments by a rapid decrease in the radium content just below the surface of the ocean bottom, and the attainment of the final equilibrium between the radio-elements in the bottom quarter of the core, which signifies a slow deposition. The radium content at equilibrium with the uranium is only 7% of that near the surface of this red clay deposit. The higher surface conc. of radium and ionium are therefore only transient phenomena, produced by some unknown mechanism.

1865 539.163.2

Radiations from radioactive gold, tungsten and dysprosium. CLARK, A. F. *Phys. Rev.*, 61, *pp.* 242–248, *March* 1 *and* 15, 1942.—Level schemes are deduced for Au and W from measurement of β–γ and γ–γ coincidences, together with a knowledge of the energies of the radiations emitted. The β-ray spectrum of Au^{198} is simple with an end-point of 0·78 eMV. The residual nucleus emits 2 γ-rays in cascade. W^{187} has a complex β-ray spectrum. The high-energy group has a max. energy of 1·4 eMV while the one of lower energy has an end point of 0·5 eMV and is followed by a 0·9 eMV γ-ray and some other γ-rays which give γ-γ coincidences. The Dy β-ray end point is 1·2 eMV and the max. energy γ-ray is 1·1 eMV.

1866 539.165

On the theoretical half-lives of β-activities. CRITCHFIELD, C. L. *Phys. Rev.*, 61, *pp.* 249–254, *March* 1 *and* 15, 1942.—The theoretical $\frac{1}{2}$-lives of forbidden β-transitions are determined as a function of the max. energy and the nuclear charge, for 5 types of interaction assumed in Fermi's theory. Nuclear charge is assumed $\ll 137$. The $\frac{1}{2}$-lives in most first forbidden and some second forbidden transitions may be expected to be approx. $\propto$ (max. energy)$^{-5}$. In general,

however, first forbidden transitions may obey an inverse 7th power law and second forbidden an inverse 7th or 9th power law.

1867 539.165.8

Forbidden transitions in β-decay and orbital electron capture and spins of nuclei. MARSHAK, R. E. *Phys. Rev.*, 61, *pp.* 431–449, *April* 1 *and* 15, 1942.—A general formula giving min. lifetimes for forbidden β-transitions of arbitrary order or forbidden orbital electron capture is derived. Exact Coulomb wave functions are used for the electron. The application of the tensor interaction to K^{40} and to the other long-lived β-emitters, Rb^{87}, Lu^{176}, Be^{10}, C^{14}, and to existing data on orbital electron capture, leads to certain spin and parity predictions about parent and product nuclei. The stability of the known neighbouring isobars and the conditions under which *L*-electron capture becomes more probable than *K*-electron capture are discussed.

1868 539.172

Distribution in angle of protons from the D–D reaction. MANNING, H. P., HUNTOON, R. D., MYERS, F. E., AND YOUNG, V. J. *Phys. Rev.*, 61, *pp.* 371–374, *March* 1 *and* 15, 1942.—The angular distribution of the disintegration protons from the D–D reaction has been investigated as a function of energy from 60 ekV to 390 ekV. The distribution is represented by $I(\theta) = 1 + A\cos^2\theta$ at any one energy. The value of A increases smoothly with bombarding energy over the range investigated.

1869 539.172.1

The angular distribution of positron annihilation radiation. BERINGER, R., AND MONTGOMERY, C. G. *Phys. Rev.*, 61, *pp.* 222–224, *March* 1 *and* 15, 1942.—The angular distribution of the 2 quanta emitted in the annihilation of a positron and an electron was observed with coincidence counters of high resolving powers both in time and angle. The direct observations are consistent with the hypothesis that the 2 quanta are emitted in exactly opposite directions to within 1°. A comparison of the counter eff. obtained from this distribution curve with a direct and independent measurement of the counter eff. for annihilation shows that the ½-width of a possible distribution of deviations from strict collinearity is 0 to within 15′. The momentum balance is accurately maintained by the quanta alone, and a positron stops before it is annihilated.

1870 539.181.08

Thick-target yield of Na^{24} under deuteron bombardment. BAILEY, C. L., AND WILLIAMS, J. H. *Phys. Rev.*, 61, *p.* 539, *April* 1 *and* 15, 1942.—The yield of Na^{24} from the reaction $Na^{23} + H^2 \rightarrow Na^{24} + H^1$ was studied in the range 1·5 to 3·0 eMV, with deuterons furnished by the pressure electrostatic generator.

1871 539.185

On the depolarization of neutron beams by magnetic fields. HALPERN, O., AND HOLSTEIN, T. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 112–118, *March*, 1942.—[See Abstr. 1926 (1941)].

1872 539.185.7

Resonance absorption of neutrons in rhodium, antimony and gold. FEENY, H., LAPOINTE, C., AND RASETTI, F. *Phys. Rev.*, 61, *pp.* 469–475, *April* 1 *and* 15, 1942.—The following experiments were performed on the resonance neutrons of Rh, Sb^{121} and Au: absorption in the element itself, absorption in B, measurement of the total activation in an extended volume of hydrogenous material. The const. evaluated are the resonance energy, the absorption coeff. for self-indication, and the level width. In Sb and Au, a small fraction of the resonance activity induced in thin detectors is due to levels of higher energy. The observed absorption coeff. for thermal neutrons in Rh and Au agrees with the one calculated from the Breit and Wigner formula, by taking into account only the resonance level observed. In Sb the calculated value is 6 times larger than the one observed, which suggests the interference effect of negative levels.

1873 539.215.5 : 621.357.5

The intermediate colloid state in the formation of gold and platinum ions. FINK, C. G. *J. Phys. Chem.*, 46, *pp.* 76–81, *Jan.*, 1942.—[Abstr. 931 B (1942)].

1874 539.23 : 537.533.73 : 548

Electron diffraction studies on thin films. III. Powder patterns containing anomalies produced by secondary scattering. GERMER, L. H. *Phys. Rev.*, 61, *pp.* 309–312, *March* 1 *and* 15, 1942.—As a consequence of tolerance in glancing angle in the production of diffracted electron beams, each first-order beam can itself be diffracted a second time by the same set of planes, thus producing an apparent second-order beam. In patterns from polycrystalline substances this results in strengthening all second-order diffraction rings. The effect is appreciable only when the individual crystals are of considerable size, and it can be observed only when a true second-order diffraction ring is very weak. The phenomenon has been observed in CuCl, CuBr and CaF_2.

1875 539.234

The structure of evaporated films of chromium and aluminium on glass. OLIVER, A. R. *Phys. Rev.*, 61, *pp.* 313–314, *March* 1 *and* 15, 1942.—The structure of evaporated films of Al on glass, and of Al on Cr deposited on glass, was investigated by electron diffraction. No evidence was found of the nature of the hardening produced by using a Cr base or by washing with water. The oxide film on Al, if present, is very thin and amorphous.

1876 539.26

X-ray analysis of some organic compounds. JOSHI, R. H., AND KAPADIA, M. R. *J. Univ. Bombay*, 10, *pp.* 35–39, *Nov.*, 1941.—Crystals have been studied by the rotating-crystal method. The dimensions of the unit cell, the number of molecules in the cell and the space group to which the crystals belong, are determined.

1877 539.26

Specimen holder for powder diffraction samples. BURR, A. A. *Rev. Sci. Instrum.*, 13, *pp.* 127–128, *March*, 1942.

1878 539.31

An extension of Saint-Venant's principle, with applications. GOODIER, J. N. *J. Appl. Phys.*, 13, *pp.* 167–171, *March*, 1942.—Simple energy considerations lead to the conclusion that forces applied in the neighbourhood of a rigidly fixed portion of an elastic solid can cause only local stress and strain.

This principle is used in the calculation of the stiffness of a thin layer of elastic material confined between rigid plates, under any kind of load applied to the plates.

1879 539.31

Determining critical states of equilibrium of plates and shells under initial stress. HENCKY, H. *J. Appl. Mech.*, 9, *A27–A30*, *March*, 1942. The author develops a series of formulae, by means of which the stability of a cylindrical shell under various conditions of stress may be determined. The practical applications of these formulae are illustrated by examples.

1880 539.319 : 542.2

Stress analysis and design of high-speed angle centrifuges. PICKELS, E. G. *Rev. Sci. Instrum.*, 13, *pp.* 101–114, *March*, 1942.—A graphical method for determining mechanical stresses in high-speed angle centrifuges and equations for obtaining approx. values are presented. Design is discussed, and stresses are determined for several typical rotors. A properly designed rotor having a dia. of 20 cm. and accommodating several hundred cm.^{3} of fluid can operate up to 50 000 r.p.m. for thousands of runs.

See Abstr. 1971 539.32 : 539.434 : 548

1881 539.37

Note on plane strain. OSGOOD, W. R. *J. Appl. Mech.*, 9, *A26*, *March*, 1942.

1882 539.378.3

Mechanism for self-diffusion in metallic copper. HUNTINGTON, H. B., AND SEITZ, F. *Phys. Rev.*, 61, *pp.* 315–325, *March* 1 *and* 15, 1942.—The problem of the mechanism of diffusion in metallic copper is discussed from the standpoint of the modern theory of metals. Three competing processes are considered in detail, the mechanism of direct interchange of atoms, of interstitial diffusion, and of vacancy diffusion. The energies of the equilibrium and saddle-point configurations for the processes are determined, (1) in an approximation in which the electronic charge distribution is assumed to be uniform throughout the lattice, (2) in a further approximation in which polarization is taken into account by a simple variational method based on the 1-electron scheme. The results indicate that the vacancy mechanism is strongly preferred, and yield a value of the activation energy for diffusion in agreement with the observed one.

1883 539.378.3

Self-consistent treatment of the vacancy mechanism for metallic diffusion. HUNTINGTON, H. B. *Phys. Rev.*, 61, *pp.* 325–338, *March* 1 *and* 15, 1942.—A detailed calculation of the energy needed to form a vacancy has been carried out. A self-consistent solution to the Hartree–Foch equation was used with a free-electron model corresp. to the Cu lattice. The result agreed with the value predicted. A rough upper limit was established for the energy required to move a vacancy. This value compares satisfactorily with the observed energy of activation for Cu self-diffusion. The anisotropy in Zn self-diffusion can also be explained on the basis of a vacancy process.

1884 539.384.4

A study of the collapsing-pressure of thin-walled cylinders. STURM, R. G. *Bull. Univ. Ill. Engng Exp. Sta.*, *No.* 329, *pp.* 7–80, *Nov.* 11, 1941.—The author investigates the elastic behaviour of thin circular cylindrical shells subjected to uniform external pressure and determines the pressure at which such shells collapse. Their elastic behaviour is compared with the results of theoretical analysis. The investigation is extended to round cylinders stiffened with rings, to slightly out-of-round cylinders and to plastic action. The collapsing-pressure per unit of area for thin-walled round cylinders is = (collapsing stiffness) × (thickness/dia.)^3. Analytical values of the collapsing-pressure for supported cylinders is on the average less, and for cylinders with fixed edges considerably more than the test values. Additional conclusions are drawn from comparisons of the analytical results and the test data. G. E. A.

1885 539.384.4

Buckling of the circular plate beyond the critical thrust. FRIEDRICHS, K. O., AND STOKER, J. J. *J. Appl. Mech.*, 9, *A7–A14*, *March*, 1942.—A complete mathematical solution of the problem of buckling with large deflections of a thin circular plate under uniform radial pressure is given, assuming radial symmetry.

1886 539.389.3

On relaxation effects in amorphous media. SIMHA, R. *J. Appl. Phys.*, 13, *pp.* 201–207, *March*, 1942.—The Maxwell relaxation theory is briefly stated. Extensions to systems built up from several components with different relaxation times are discussed. In the case of materials of high mol. wt., it is more appropriate to assume a continuous distribution of relaxation rates. Equations are formulated whose solution gives the distribution function in terms of the rate of deformation and of the applied stress or the elongation in terms of the 2 other quantities. The connection with the corresponding distribution of dielectric relaxation times, molecular inhomogeneity and chain branching, and effects at mechanical frequencies large compared with the relaxation rates, are pointed out.

1887 539.4 : 621.3.012.8

Mechanical behaviour of bitumen. LETHERSICH, W. *Rep. Brit. Elect. Allied Industr. Res. Assoc. Suppl. to Ref. A/T83*, [8 *pp.*], 1941.—The report, which is a supplement to A/T83 [see Abstr. 2228 (1941)], gives a list of errata. Bitumen is thought to possess a colloidal structure consisting of 2 principal components, the asphaltenes and the dispersion medium, known as petrolenes, which behave as a viscous fluid. The asphaltenes consist of unsaturated hydrocarbons bound to nuclei which are particles of microcrystalline graphite. The mechanical behaviour of bitumen may be represented by a model consisting of a spring in series with a dash-pot which is fixed in parallel with another spring and dash-pot. The first spring represents the behaviour of the asphaltenes, while the parallel part simulates the behaviour of the petrolenes. The behaviour of this model under a steady stress is deduced mathematically while, for alternating stresses, another model is considered, consisting of a condenser in parallel with a resistance and another (shunted) condenser. The variation of tensile strength with rate of loading is also dealt with. A. C. W.

1888 539.4.011.25

A theoretical approach to the problem of yarn strength. SULLIVAN, R. R. *J. Appl. Phys.*, 13, *pp.* 157–167, *March*, 1942.—An idealized yarn composed of fibres with specified properties is treated analytically. The results are presented in the form of equations and curves which relate the yarn strength to the fibre properties and the degree of twist. Two cases are studied: (1) All fibres alike; (2) fibre properties variable. The optimum twist multiplier is determined by the fibre length, fineness and coeff. of friction, whereas the max. yarn strength (corresponding to the optimum twist multiplier) is more strongly dependent upon the intrinsic fibre strength than upon the other properties.

1889 539.433 : 620.19

The mechanism of cavitation erosion. POULTER, T. C. *J. Appl. Mech.*, 9, *A31–A37*, *March*, 1942.—[Abstr. 867 B (1942)].

See Abstr. 1971 539.434 : 539.32 : 548

1890 539.5 : 629.13

The cold-pressing properties of duralumin-type alloy sheets, with special reference to the production of large pressings for aircraft. ARROWSMITH, J. C., WOLFE, K. J. B., AND MURRAY, G. *J. Inst. Met.*, 68, *pp.* 109–132, *April*, 1942.—An account is given of the difficulties experienced in the cold pressing of duralumin-type alloy sheet. The distortion which results from the heat-treatment of the material is described, together with the methods for limiting its extent and overcoming its effect. Low ductility and a high degree of spring-back make the duralumin alloys less amenable to cold pressing than is mild steel, and methods necessary for the production of the more difficult pressings are discussed. The ductility rises to a max. after an interval of time dependent upon the temperature of storage, and then falls continuously as age-hardening proceeds. A reliable indication of the deep-drawing properties is to be found in the microstructure and the value for percentage elongation obtained in the tensile test carried out on freshly solution-heat-treated material.

1891 539.56

Brittle point of rubber upon freezing. SELKER, M. L., WINSPEAR, G. G., AND KEMP, A. R. *Industr. Engng Chem.*, 34, *pp.* 157–160, *Feb.*, 1942.—The brittle temperature of soft vulcanized rubber is independent of the state of cure within the limits found in industrial practice. In rubber-sulphur compounds where a large amount of sulphur is used, there is nearly a linear dependence of brittle temperature on combined sulphur. Additions of reinforcing pigments produce little effect; coarse fillers raise the brittle temperature. With the exception of butadiene polymer and butadiene-styrene copolymer, all synthetic rubbers have higher brittle temperatures than rubber. The carbon-black-reinforced stocks of the synthetics show a lower brittle temperature than the crude material. Brittle temperature is independent of mol. wt. within wide limits above a min. value.

CHEMISTRY

1892 541.115

The kinetics and rapid thermochemistry of carbonic acid. ROUGHTON, F. J. W. *J. Amer. Chem. Soc.*, 63, *pp.* 2930–2934, *Nov.*, 1941.—The rate of heat evolution when HCl is mixed with $NaHCO_3$ was studied by the thermal method of measuring the velocity of rapid chemical reactions. The heat was evolved in 2 stages, of which the first was instantaneous, being due to the combination of Hx and HCO_3^- ions to form H_2CO_3, whereas the second, lasting up to 1 sec. was due to the dissociation of H_2CO_3 into CO_2 and H_2O. Preliminary measurements were also made of the rate of dissociation of free carbamic acid, and of the ionization const. of its carboxyl group.

1893 541.115

The thermal reaction between hydrogen and oxygen at higher pressures. OLDENBERG, O., AND SOMMERS, JR., H. S. *J. Chem. Phys.*, 10, *p.* 193, *March*, 1942.

1894 541.122 : 535.566.2

Quantitative investigations of amino acids and peptides. VII. Equilibria between amino acids and formaldehyde. FRIEDEN, E. H., DUNN, M. S., AND CORYELL, C. D. *J. Phys. Chem.*, 46, *pp.* 215–221, *Feb.*, 1942.—A method is described for the determination of the const. of the amino-acid formaldehyde equilibria by polarimetric titration.

1895 541.123.3

A new method for determining dineric distribution. BANCROFT, W. D., AND HUBARD, S. S. *J. Amer. Chem. Soc.*, 64, *pp.* 347–353, *Feb.*, 1942.—Describes a graphical method of determining the composition of conjugate phases in ternary systems.

1896 541.123.4

Association of benzoic acid in benzene. WALL, F. T., AND ROUSE, JR., P. E. *J. Amer. Chem. Soc.*, 63, *pp.* 3002–3005, *Nov.*, 1941.—A method involving the distribution between two non-volatile solutes was used.

1897 541.123.4

Distribution of benzoic acid between water and benzene. WALL, F. T. *J. Amer. Chem. Soc.*, 64, *pp.* 472–473, *Feb.*, 1942.—[See Abstr. 1896 (1942)].

1898 541.123.5

The system ferric-chloride–sodium-chloride. JOHNSTONE, H. F., WEINGARTNER, H. C., AND WINSCHE, W. E. *J. Amer. Chem. Soc.*, 64, *pp.* 241–244, *Feb.*, 1942.—The phase diagram of the system was determined. A eutectic, having the composition of 46 mole % NaCl, 56 mole % Fe_2Cl_6 fuses at 158°. The v.p. of pure Fe_2Cl_6 and of 3 mixtures with NaCl were measured. No evidence was found for the existence of a compound between the two chlorides. The extremely low v.p. of Fe_2Cl_6 in the presence of NaCl at temperatures above the b.p. of the pure compound is due to the normal effect of the solute in lowering the v.p. This prevents the possibility of volatilizing Fe_2Cl_6 during chlorination of ores in the presence of excess NaCl.

1899 541.124

The molecular kinetics of trypsin action. BUTLER, J. A. V. *J. Amer. Chem. Soc.*, 63, *pp.* 2971–2974, *Nov.*, 1941.

1900 541.124

Rate and equilibrium studies of carbinol formation in the triphenylmethane and sulphonphthalein dyes. HOCHBERG, S., AND LAMER, V. K. *J. Amer. Chem. Soc.*, 63, *pp.* 3110–3120, *Nov.*, 1941.

1901 541.124

Molecular rearrangements of 17-hydroxy-pregnane compounds. STAVELY, H. E. *J. Amer. Chem. Soc.*, 63, *pp.* 3127–3131, *Nov.*, 1941.

1902 541.124

The mechanism of elimination reactions. I. The decomposition of quaternary ammonium bases and of xanthate esters. STEVENS, P. G., AND RICHMOND, J. H. *J. Amer. Chem. Soc.*, 63, *pp.* 3132–3136, *Nov.*, 1941.—The authors consider that a hydrogen bond is first formed intermolecularly between the β hydrogen and the anion, and that the proton is then removed completely.

1903 541.124

The reactivity of amalgams. LIEBHAFSKY, H. A., AND WINSLOW, A. F. *J. Amer. Chem. Soc.*, 63, *pp.* 3137–3142, *Nov.*, 1941.—The separatory-funnel method was used to measure the rates at which five representative base metals, reasonably soluble in mercury, were oxidized by air in contact with acid solutions.

1904 541.124

A kinetic study of the reactions of *n*-butyl bromide with the sodium salts of phenol, thiophenol and *n*-butyl mercaptan. QUAYLE, O. R., AND ROYALS, E. E. *J. Amer. Chem. Soc.*, 64, *pp.* 226–230, *Feb.*, 1942.—The rates of reaction were determined under comparable conditions, and activation energies determined with both methyl and ethyl alcohols as solvents. A mechanism for the reactions is postulated and discussed in the light of experimental data and theoretical considerations.

1905 541.124

Activity coefficients of strontium chloride by an isopiestic method. PHILLIPS, B. A., AND WATSON, G. M., WITH FELSING, W. A. *J. Amer. Chem. Soc.*, 64, *pp.* 244–247, *Feb.*, 1942.—Certain improvements in technique and in design of apparatus for the isopiestic method of determining activity coeff. are described. The activity coeff. were determined for aqueous solutions of $SrCl_2$, using $BaCl_2$ as the ref. std.

1906 541.124 : 541.128

Kinetics of hydrogen consumption, oxygen elimination and liquefaction in coal hydrogenation. Nature of the catalytic reactions. STORCH, H. H., HAWK, C. O., AND O'NEILL, W. E. *J. Amer. Chem. Soc.*, 64, *pp.* 230–236, *Feb.*, 1942.—An analysis is made of data on the effect of a SnS catalyst on the rate of change of measurable quantities in the hydrogenation of a bituminous coal in a small autoclave. The rate-determining step for the H absorption varies with temperature. Below 300° it is apparently a chemical reaction between a H carrier and unsaturated groups in the coal; between 300° and 370° diffusion of H through a liquid film on the surface of the coal and catalyst is the slowest step; above 370° the rate-determining step is a chemical reaction between a hydro-aromatic and the O and unsaturated groups in the products of the primary decomposition of the coal. The chief function of the catalyst is to increase the rate of regeneration of a H carrier, which is a hydro-aromatic compound such as hexahydronaphthalene. The reactions of the H carrier with O and unsaturated groups are largely non-catalytic. The effects of the catalyst on the rate of O elimination and on that of liquefaction are similar.

See Abstr. 1943 541.124 : 541.6

1907 541.127 : 517.925

The rate equations for consecutive reactions. HILL, T. L. *J. Amer. Chem. Soc.*, 64, *pp.* 465–467, *Feb.*, 1942.—Discusses the solution of a system of differential equations representing chain reactions.

1908 541.128

Comparison of metallic chlorides as catalysts for the Friedel–Crafts ketone synthesis. I. DERMER, O. C., WILSON, D. M., JOHNSON, F. M., AND DERMER, V. H. **II.** DERMER, O. C., AND BILLMEIER, R. A. *J. Amer. Chem. Soc.*, 63, *pp.* 2881–2883, *Nov.*, 1941, *and* 64, *pp.* 464–465, *Feb.*, 1942.

1909 541.128

Inhomogeneity in coprecipitated copper-hydroxide–magnesium-hydroxide catalysts and its effect upon their activity. TAYLOR, E. H. *J. Amer. Chem. Soc.*, 63, *pp.* 2906–2911, *Nov.*, 1941.

1910 541.128

The effect of method of preparation upon the activity of coprecipitated copper-hydroxide–magnesium-hydroxide catalysts. HOLMES, J. W., AND TAYLOR, E. H. *J. Amer. Chem. Soc.*, 63, *pp.* 2911–2915, *Nov.*, 1941.

1911 541.128

Alkali and alkaline earth metals as catalysts in the hydrogenation of organic compounds. BERGSTROM, F. W., AND CARSON, J. F. *J. Amer. Chem. Soc.*, 63, *pp.* 2934–2936, *Nov.*, 1941.—Discusses the mechanism of this reaction by reducing organic compounds with high-pressure hydrogen in the presence of alkali metals as catalysts.

1912 541.128

The catalytic effect of water on the aminolysis of ethyl phenylacetate in *n*-butylamine. GLASOE, P. K., SCOTT, L. D., AND AUDRIETH, L. F. *J. Amer. Chem. Soc.*, 63, *pp.* 2965–2967, *Nov.*, 1941.

1913 541.128

The partial reduction of acetylenes to olefins using an iron catalyst. II. Enyne and dienyne reduction. THOMPSON, JR., A. F., AND SHAW, E. N. *J. Amer. Chem. Soc.*, 64, *pp.* 363–366, *Feb.*, 1942.

1914 541.128

The influence of electrolytes upon ammonolysis by liquid ammonia. LEMONS, J. F., WILLIAMSON, P. M., ANDERSON, R. C., AND WATT, G. W. *J. Amer. Chem. Soc.*, 64, *pp.* 467–468, *Feb.*, 1942.

1915 541.128

Vapour-phase partial oxidation of ethyl alcohol variables influencing catalyst behaviour. MICHELS, L. R., AND KEYES, D. B. *Industr. Engng Chem.*, 34, *pp.* 138–146, *Feb.*, 1942.—A quantitative study of the catalytic partial oxidation of ethyl alcohol and the intermediate products, as well as the effect of the addition of these products on the main oxidation.

1916 541.128

Composition of catalytically cracked gasolines. BATES, J. R., ROSE, JR., F. W., KURTZ, JR., S. S., AND MILLS, I. W. *Industr. Engng Chem.*, 34, *pp.* 148–152, *Feb.*, 1942.—The high octane is due to a large excess of isoparaffins over normal paraffins in the lower-boiling portions of the gasoline and to a high content of aromatic compounds in the higher-boiling fractions.

These relations are not affected by the olefin content of the gasoline which may vary over a wide range with varying conditions of cracking.

See Abstr. 1906 541.128 : 541.124
See Abstr. 1924 541.128.3 : 541.145
See Abstr. 1774 541.132 : 535.243

1917 541.133.08

Anomalies in conductivity measurements in presence of hydrogen peroxide. BOBTELSKY, M., AND SIMCHEN, A. E. *J. Amer. Chem. Soc.*, 64, *pp.* 454–461; *Feb.*, 1942.—Conductometric titrations of electrolytic solutions (salts, acids) give, in presence of small quantities of H_2O_2, max. additional resistances ($\Delta R_{max.}$) that diminish on further additions. These additional resistances are independent of electrolyte conc. and partly also of electrolyte character (except chlorides or fluorides). They are conspicuous only during measurements in presence of H_2O_2. A special clearing or a previous cathodic depolarization of the electrodes is without influence. The abs. magnitude of the additional resistances depends, at equal working conditions, on the chemical character of the electrodes and on the conc. of H_2O_2. They are smaller with Pt than with Sn electrodes and are at 1 000 c./s. about $\frac{1}{2}$ the value obtained at 50 c./s. For a given H_2O_2 conc. ΔR is a const. that must be counted with in conductivity measurements.

1918 541.135.5 : 545.37 : 541.182.63

The electrochemical properties of mineral membranes. III. The estimation of ammonium-ion activities. IV. The measurement of ammonium-ion activities in colloidal clays. MARSHALL, C. E., AND BERGMAN, W. E. *J. Phys. Chem.*, 46, *pp.* 325–334, *Feb.*, 1942.—[See Abstr. 1646 (1942)]. The clay membrane electrode (hydrogen montmorillonite dried at 490°C.) can be used to measure NH_3-ion activities below 0·1 *N* in solutions in which it is the only monovalent cation and in which the conc. of divalent ions is less than that of the NH_3-ion. H ions interfere, but a correction can be applied provided the membrane is not attacked. The *p*H should be over 4. Titration curves with NH_4OH have been obtained for Putnam (beidellite), Wyoming bentonite (montmorillonite), illite, and kaolinite. NH_3 salts of weak acids or of high initial *p*H lose NH_3 ions to the clay in much the same way as does NH_4OH. The activity of NH_3 ions from NH_4Cl is not affected by the presence of the polyvalent clay anions within the range studied.

1919 541.138.3

Effect of surface-active agents on electro-organic reductions. PROUDFIT, C. W., AND FRANCE, W. G. *J. Phys. Chem.*, 46, *pp.* 42–51, *Jan.*, 1942.—Since surface-active agents facilitate the reduction of metallic ions, an investigation was made of their action in the electrochemical reduction of organic depolarizers. The types chosen were sulphonated oils, soaps, tar distillates, esters and amides, alkyl aryl sulphonates, fatty acid sulphates and sulphonates, and quaternary NH_4 compounds. The depolarizers were *o*-nitrotoluene, chloropicrin, benzaldehyde, anisaldehyde, *m*- and *p*-tolualdehyde, acetophenone and pyrrole. None of the agents aided the reductions, the effect being always to decrease the current efficiency of the process. Detailed conclusions are given. N. M. B.

1920 541.141.1

The photolysis of azomethane. CANNON, C. V., AND RICE, O. K. *J. Amer. Chem. Soc.*, 63, *pp.* 2900–2905, *Nov.*, 1941.—The quantum yield at 3 660 Å is unity within the limits of experimental error. It remains unity up to a pressure of 63 cm., showing no indication of the occurrence of deactivation by collision. The quantum yield is unaffected by a 4-fold variation of light intensity, and by excess of CO_2.

1921 541.141.1

The photo-oxidation of iodide ion sensitized by eosin. LIVINGSTON, R. *J. Phys. Chem.*, 46, *pp.* 233–238, *Feb.*, 1942.—At relatively low intensities, the quantum yield of the photo-oxidation of iodide ion sensitized by eosin is $\propto$ (intensity of the absorbed light)$^{-\frac{1}{2}}$ and $\propto$ (oxygen conc.)$^{\frac{1}{2}}$. Values of the yield as high as 2·8 have been observed.

1922 541.144.7

Photochemical studies. XXXIV. The photochemical decomposition of benzene. WILSON, J. E., AND NOYES, JR., W. A. *J. Amer. Chem. Soc.*, 63, *pp.* 3025–3028, *Nov.*, 1941.—Acetylene, hydrogen and a solid resembling cuprene, are produced when benzene is exposed to radiation of wavelength less than 2 000 Å. While definite conclusions concerning mechanism are not possible, the best explanation of the data is based on a small amount of primary dissociation of benzene molecules into acetylene.

1923 541.145

The effect of coloured ions on the photo-inactivation of invertase. LARDY, H., AND ANDERSON, T. F. *Science*, 95, *pp.* 330–331, *March* 27, 1942.

1924 541.145 : 541.128.3

Carboxylation. I. The photochemical and peroxide-catalyzed reactions of oxalyl chloride with paraffin hydrocarbons. KHARASCH, M. S., AND BROWN, H. C. **II. The reaction of oxalyl chloride with unsaturated hydrocarbons.** KHARASCH, M. S., KANE, S. S., AND BROWN, H. C. *J. Amer. Chem. Soc.*, 64, *pp.* 329–334, *Feb.*, 1942.—The photolysis of oxalyl chloride in the presence of paraffin hydrocarbons leads to the formation of acid chlorides—involving the direct substitution of H by the –COCl group. Organic peroxides catalyse a similar dark reaction between paraffin hydrocarbons and oxalyl chloride. In both instances the reaction proceeds by means of a chain involving atoms and alkyl free radicals. In the reaction between oxalyl chloride and such olefins as 1,1-diphenylethylene, styrene, α-methylstyrene and 1-methylcyclohexene, the chloroformyl group replaces a H on one of the doubly-bonded C atoms. The factors influencing the rate of the reaction and the yield indicate that the reaction probably proceeds through a polar mechanism.

1925 541.18 : 532 : 537.363

Importance of dialysis in the study of colloids. VIII. Colloidal ceric hydroxide. VORA, V. C., BARVE, P. M., AND DESAI, B. N. *J. Univ. Bombay*, 10, *pp.* 40–47, *Nov.*, 1942.—The changes in the cataphoretic speed, conductivity, stability and viscosity, of colloidal ceric hydroxide under different conditions have been studied. With the progress of dialysis, the speed first increases and then decreases, the conductivity and stability continuously decrease and the viscosity first decreases and then increases. On

dilution the cat. speed first increases and then decreases for sols dialysed for periods shorter than the max. in the speed/dialysis curve, and continuously decreases for sols dialysed for longer periods. The conductivity and stability continuously decrease on dilution. The speed, conductivity and stability decrease while the viscosity increases during ageing. On exposure to sunlight, the speed, conductivity, stability and viscosity decrease. The results support the conclusions arrived at previously [Abstr. 1102 (1941)].

1926 541.18 : 532.73

Diffusion as a function of aggregation in colloidal media. BRANSON, H. *Bull. Math. Biophys.*, 4, *pp.* 1–6, *March*, 1942.—With the assumption that adsorption is a simple function of surface area, an analytical treatment is given for the dependence of the diffusion coeff. of an adsorbable solute upon the degree of aggregation of the adsorbing colloid. Some implications of the final equation are given.

1927 541.182.2

Foaming properties of wine. AMERINE, M. A., MARTINI, L. P., AND MATTEI, W. DE. *Industr. Engng Chem.*, 34, *pp.* 152–156, *Feb.*, 1942.—No difference in foaminess produced by CO_2 or air was noted. Addition of glycerol, grape-seed tannin, oleanolic acid, and tannic acid to wines increased their foaminess, but sucrose, tartaric acid, acetaldehyde, β-sitosterol, *n*-nonacosane and ethyl acetate, had little influence. Ethyl and amyl alcohols reduced foam stability. The amounts necessary to change foaminess are too large to be of practical importance. At higher temperatures tannic acid decreases foaminess.

1928 541.182.5

State of aggregation of gelatin in non-gelating systems. KRAEMER, E. O. *J. Phys. Chem.*, 46, *pp.* 177–182, *Jan.*, 1942.—Previous studies [Abstr. 1115 (1941)] have been extended to thiourea with and without NaCl as non-gelating agent and corresponding data are reported. Results compared with those for KCNS, Na salicylate and phosphate buffer solutions, show that differences in the sedimentation behaviour of gelatin in the different solvents are only of the order of experimental error, but differences between the sedimentation const. are found. The results are discussed in detail, and the additional data confirm previous conclusions on the mol. state and degree of coiling of the gelatin. N. M. B.

1929 541.182.6.04

Stability properties of hydrophobic colloidal solutions. LEVINE, S., AND DUBE, G. P. *J. Phys. Chem.*, 46, *pp.* 239–280, *Feb.*, 1942.—A number of applications of the mutual energy of 2 colloidal particles are given [see Abstr. 600 (1940)], and it is found that the stability properties of a hydrophobic sol can be uniquely described quantitatively by the rate of coagulation. The energy max. in the expression for the interaction of 2 particles determines the stability properties in the region of slow coagulation and roughly in the coagulation zone, assuming the sol conc. to be fixed, and its dependence on particle charge, electrokinetic potential, electrolyte conc., valence of ions and particle radius, is examined. The condition for coagulation is that this energy max. be a small multiple of kT. The concept of the precipitating ion is shown to be of limited validity. The phenomena of charge reversal by trivalent ions has been studied. It is deduced that the van der Waals const. should have the same value for different electrolytes in the same sol, and fair agreement has been obtained. The dependence of the energy max. on the particle radius is discussed, as also the effect of irregularities on the particle surface. H. H. HO.

1930 541.182.6.046.7

The effect of potassium salts upon aluminium oxychloride hydrosol. KELLY, M. W., AND ROSTLER, K. S. *J. Phys. Chem.*, 46, *pp.* 317–325, *Feb.*, 1942.—Certain generalizations are made relating the structure of anions of added salts to their *p*H-raising and precipitating effects upon an aluminium oxychloride hydrosol.

1931 541.182.63 : 538.613

On the validity of the Langevin theory of orientation and the possibility of distinguishing between inherent and photo-elastic anisotropy. HELLER, W., AND QUIMFE, G. *Phys. Rev.*, 61, *p.* 382, *March* 1 *and* 15, 1942.

See Abstr. 1918 541.182.63 : 545.37 : 541.135.5

1932 541.182.8

Solid solutions of the alkali halides. TOBOLSKY, A. V. *J. Chem. Phys.*, 10, *pp.* 187–192, *March*, 1942.—X-ray studies of solid solutions of alkali halide pairs with a common ion at room temperature and at 550°C. show that these pairs can be divided into 3 groups depending on the percent deviation, δ, of their lattice parameters. In terms of the Born theory of ionic lattices, the free energy of mixing and Vegard's law, an approx. theory for the phase curve of these solid solutions is derived.

1933 541.182.8 : 669.22

The equilibrium diagram of the system silver-gallium. I. The α phase region. HUME-ROTHERY, W., AND ANDREWS, K. W. *J. Inst. Met.*, 68, *pp.* 133–143, *April*, 1942.—The equilibrium diagram of the system Ag-Ga is investigated as regards the liquidus, solidus and solid-solubility curve of the α phase. The liquidus is determined to a high degree of accuracy, and does not confirm the hypothesis of whole-number liquidus factors. The solid-solubility curve shows an abrupt change in direction at a temperature of 378°C., which is associated with the eutectoid decomposition of the close-packed hexagonal ζ phase, with which the α phase is in equilibrium at high temperature. At low temperatures the solubility of Ga in Ag diminishes more rapidly than had been suggested by earlier work. The α + liq. $\rightleftharpoons \zeta$ peritectic horizontal is divided in an exact 2 : 1 ratio by the point giving the composition of the ζ phase. The solubility of gallium in solid silver is discussed.

1934 541.183

Chromatographic adsorption analysis. STRAIN, H. H. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 245–249, *March* 15, 1942.—The various procedures of chromatographic adsorption analysis are classified and illustrated by a description of selected experiments. Apparatus, technique, adsorbents, solvents and eluants, are briefly discussed in turn, and useful future applications are forecasted; 54 sets of literature references are cited in the paper. H. H. HO.

1935 541.183.1

Adsorption by strontium salts of traces of iron from caustic soda solutions. CALDWELL, W. E., AND BOYD, C. A. *Industr. Engng Chem.*, 34, *pp.* 230–233, *Feb.*, 1942

1936 541.183.1 : 536.75

Sorption of water by cellophane. SIMRIL, V. L., AND SMITH, S. *Industr. Engng Chem.*, 34, *pp.* 226–230, *Feb.*, 1942.—Four sorption isotherms at temperatures from 16·5° to 49·5°C. are determined; curves at various equal moisture contents are constructed. The net heat of sorption is not independent of temperature. Variation in shape of the entropy curves for adsorption and desorption points to an essential difference between the two processes. The hysteresis loop is interpreted on the basis of the entropy of the sorbed water. The relation between moisture regain and relative humidity is discussed.

1937 541.183.26

The sorption of hydrogen by metals. Temperature variation experiments. GRIFFIN, C. W. *J. Amer. Chem. Soc.*, 63, *pp.* 2957–2960, *Nov.*, 1941.—Measurements have been made of the sorption of H on Pt and on Co in both the massive and the supported states under conditions in which the temperature was varied from − 78·5° to 0° and back to − 78·5°. The results, pointing to a distinction between adsorption and a second factor, apparently solution, indicate that the sorptive process is confined to straight adsorption only when the sorbent is spread almost wholly as surface. With massive metals the secondary action assumes a rôle some 5 or 10 times as great as with supported sorbents.

1938 541.23

The molecular weight of potassium bromide and the atomic weights of silver, bromine and potassium. MCALPINE, R. K., AND BIRD, E. J. *J. Amer. Chem. Soc.*, 63, *pp.* 2960–2965, *Nov*, 1941.—$KBrO_3$ was accurately converted to KBr by thermal decomposition. New values were obtained for the mol. wt. of KBr and the atom. wt. of Ag, and, from these, new values for the atom. wt. of Br and K have been calculated referred to the new value for Ag.

1939 541.24

Some observations on the oxidation and determination of the molecular weight of polynuclear aromatic compounds. CAMPBELL, W. P., SOFFER, M. D., AND STEADMAN, T. R. *J. Amer. Chem. Soc.*, 64, *pp.* 425–428, *Feb.*, 1942.

See Abstr. 1754 541.24 : 532.13

1940 541.25

The molal volumes of aliphatic hydrocarbons at their melting points. EGLOFF, G., AND KUDER, R. C. *J. Phys. Chem.*, 46, *pp.* 296–304, *Feb.*, 1942.—The molal vol. of straight-chain aliphatic hydrocarbons in the liquid state at their respective m.p. can be expressed accurately (dev. 0·09%) by equations of the type: $V = a + bn$. The data justify different values of b for series differing in degree or position of unsaturation and for the even and odd sub-sets of each series. For normal alkanes the same limiting line for each sub-set is given by $V = a' + b'n \pm c/n$ with + for even and − for odd members.

See Abstr. 1947 541.25 : 541.63

See Abstr. 1717 541.26 : 535.323 : 518.3

See Abstr. 1821 541.452 : 537.226.2

1941 541.51

Electron-sharing ability of organic radicals. XII. The effect of the radicals on the degree of association of polar molecules. XIII. The effect of the radicals in the solvent molecule. LANDEE, F. A., AND JOHNS, I. B. *J. Amer. Chem. Soc.*, 63, *pp.* 2891–2900, *Nov.*, 1941.—Measurements of the association of a series of carboxylic acids, RCOOH, in the vapour state and in solutions of $(C_2H_5)_2O$ are reported. Results show, in agreement with theory on association via H-bridge formation, that, as the electron-sharing ability of the radical attached to the associating group increases, the association of the corresponding acid decreases. A study of the behaviour in C_6H_6 of 2 compounds together, one the solute (*p*-chlorophenol) in fixed concentration, the other the solvent (benzaldehyde) in variable concentration, shows that the normalizing effect of a solvent is due to the association of the solvent with the solute. Data show that the normalizing power of a series of ketones depends in a regular way on the electron-sharing ability of the radicals attached to the CO group. Theory and experiment indicate that the dielectric const. of a solvent has no effect on associations due to H-bonding. N. M. B.

1942 541.571 : 539.133

Comments on the mechanisms of covalent-bond fission. WATERS, W. A. *J. Chem. Soc.*, *pp.* 153–157, *Feb.*, 1942.—There is a close connection between the electrostatic dipole energy and the resonance energy of any unsymmetrical covalent bond. The electrostatic factors determining the activation energies of both ionic and neutral reactions are compared, and it is shown that the favoured mechanism for unimolecular dissociation is largely determined by the dielectric const. of the solvent medium.

1943 541.6 : 541.124

The effect of structure on reactivity: nuclear substitution of benzene derivatives. MCDUFFIE, JR., H. F., AND DOUGHERTY, G. *J. Amer. Chem. Soc.*, 64, *pp.* 297–299, *Feb.*, 1942.—Data on rel. reactivities of mono-, di- and tri-substituted benzene derivatives were obtained by measurements involving the Friedel–Crafts reaction of acetyl chloride with aromatic compounds. The data for monosubstituted derivatives correlate well with the available data for nitration, the substituent const. presented by Hammett, and the rates calculated from the dipole moments. This confirms the ionic mechanism of the reaction.

1944 541.61

Polyiodides of cesium. IV. A note on the molecular formula of cesium tetraiodide. HUBARD, S. S. *J. Phys. Chem.*, 46, *pp.* 227–229, *Feb.*, 1942.

1945 541.62

Drying oils and resins. Alkali-induced isomerization of drying oils and fatty acids. BRADLEY, T. F., AND RICHARDSON, D. *Industr. Engng Chem.*, 34, *pp.* 237–242, *Feb.*, 1942.—The isomerizing action of alkali metal hydroxides on unconjugated fatty acids and oils is reviewed. The isomerizations proceed in water as well as in alcohols, provided the temperatures are sufficiently high. A commercially feasible process is described, leading to the formation of from

30 to 50% of conjugated acids from soybean and linseed oils.

1946 541.63

Studies in stereochemistry. I. Steric strains as a factor in the relative stability of some co-ordination compounds of boron. BROWN, H. C., SCHLESINGER, H. I., AND CARDON, S. Z. *J. Amer. Chem. Soc.*, 64, *pp.* 325–329, *Feb.*, 1942.

1947 541.63 : 541.25

Studies of the physical properties of alicyclic hydrocarbons. I. Molal volumes of mono-alicyclic hydrocarbons at 20°C. EGLOFF, G., AND KUDER, R. C. *J. Phys. Chem.*, 46, *pp.* 281–295, *Feb.*, 1942.—The molal vol. of the known alicyclic hydrocarbons (not containing fused rings) in the liquid state at 20°C. are studied from the viewpoint of isomerism and homology. The effects of the positions of side chains and double bonds are discussed. The molal vol. in homologous series are additive and can be reproduced within a few tenths of 1% by linear functions of the number of C atoms. Comparison with aliphatic hydrocarbons shows the effects of ring closure and indicates a mol. structure in agreement with Ruzicka's picture.

1948 541.64

The polymerization of styrene in thymol solution. MOORE, J. K., BURK, R. E., AND LANKELMA, H. P. *J. Amer. Chem. Soc.*, 63, *pp.* 2954–2957, *Nov.*, 1941.

1949 541.64

Intramolecular condensations in polymers. WALL, F. T. *J. Amer. Chem. Soc.*, 64, *pp.* 269–273, *Feb.*, 1942.—The statistical problem involved in the removal of oxygen through intramolecular aldol condensations has been carried out for infinitely long "head-to-tail," random and "head-to-head–tail-to-tail" polymers. The results for pure polymers are extended to copolymers.

1950 541.64

The polymerization of some derivatives of trimethylaluminium. DAVIDSON, N., AND BROWN, H. C. *J. Amer. Chem. Soc.*, 64, *pp.* 316–324, *Feb.*, 1942.

1951 541.65 : 535.338

Raman spectra evidence for hindrance of resonance by ortho substitution. SAUNDERS, R. H., MURRAY, M. J., AND CLEVELAND, F. F. *J. Amer. Chem. Soc.*, 63, *pp.* 3121–3123, *Nov.*, 1941.—Acetyldurene, nitromesitylene and several carbonyl derivatives of mesitylene, were examined by means of the Raman effect.

1952 541.65/69

Structure–property relationships in some isomeric octanols. DOROUGH, G. L., GLASS, H. B., GRESHAM, T. L., MALONE, G. B., AND REID, E. E. *J. Amer. Chem. Soc.*, 63, *pp.* 3100–3110, *Nov.*, 1941.

1953 541.653.3

The mutarotation of glucose in water-methanol mixtures. DYAS, H. E., AND HILL, D. G. *J. Amer. Chem. Soc.*, 64, *pp.* 236–240, *Feb.*, 1942.—The rates change in the directions to be predicted from the dielectric const. of the mixtures, but do not strictly follow the theoretical laws. The sp. rotations of pure α- and β-glucose and of the equilibrium mixture were measured in the same solvents at 2 temperatures, and equilibrium const. calculated. The equilibrium const. are not independent of temperature. The heats of reaction and heats of activation show large and parallel changes with methanol conc., with max. or min. in a 60% methanol solution.

1954 541.653.3

Crystalline modifications of D-manno-D-gala-heptose, and the preparation of some of its derivatives. MONTGOMERY, E. M., AND HUDSON, C. S. *J. Amer. Chem. Soc.*, 64, *pp.* 247–254, *Feb.*, 1942.

1955 541.654

Type analysis of hydrocarbon oils. DEANESLY, R. M., AND CARLETON, L. T. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 220–226, *March* 15, 1942.—A new type analysis of petroleum oils has been developed based on the evaluation of unsaturation and the determination of the structure of the completely saturated sample. In operation, this system was consistent with the known data on both pure hydrocarbons and hydrocarbon oils, and appeared equally applicable to straight-run and cracked products and to synthetic oils over all the range in which the requisite measurements were possible. The analysis yielded self-consistent results, while that of Waterman, the only other generally used for the same purpose (see *J. Inst. Petrol. Tech.*, 21, 661, 1935), did not. H. H. HO.

1956 541.67 : 537.226.1 : 621.315.616.96

Electrical properties of solids. XII. Plasticized polyvinyl chloride. MEAD, D. J., TICHENOR, R. L., AND FUOSS, R. M. *J. Amer. Chem. Soc.*, 64, *pp.* 283–291, *Feb.*, 1942.—[See Abstr. 274 (1942)]. Data at 40° and 60°, at 60, 600 and 6 000 c./s. are given for polyvinyl chloride plasticized with 8 to 30% by wt. of various compounds. A simple empirical relationship connecting loss factor and plasticizer conc. is given. The viscosity varies inversely as the 3rd or 4th power of the rel. conc., depending on the temperature. The conc. at which a given plasticizer produces a given internal viscosity, as measured by a characteristic electrical response, depends on the size and shape of the plasticizer molecule. A long cylindrical molecule is more effective in reducing viscosity than a spherical molecule of the same mol. wt. Plasticizers of about the same size and shape are about equally effective as plasticizers, regardless of their chemical structure. For polyvinyl chloride, however, a polar or polarizable group must be present in the plasticizer in order for it to interact with the polymer.

1957 541.8

The solubility diagrams for the systems ethylidene-diacetate/acetic-acid/water and vinyl-acetate/acetone/water. SMITH, J. C. *J. Phys. Chem.*, 46, *pp.* 229–232, *Feb.*, 1942.

1958 541.8

Determination of solubilities of gases at high temperatures and high pressures by the rotating bomb. IPATIEFF, V. N., and MONROE, G. S. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 166–171, *Feb.* 15, 1942.—Data and curves are given for the solubility in C_6H_6 of CH_4, C_3H_8, and SO_2 by the modified rotating bomb. Results show that for CH_4 the pressure is the principal factor affecting the solubility; the effect of temperature is minor, becoming more noticeable at higher pressures. For C_3H_8 both

temperature and pressure have a marked influence on the solubility. N. M. B.

1959 541.8

Solubility of stannous oxide in perchloric acid. GORMAN, M., AND LEIGHTON, P. A. *J. Amer. Chem. Soc.*, 64, *pp.* 719–720, *March*, 1942.

1960 542.2

An accurate automatic syringe mechanism. SIMS, A. L., AND JORDAN, R. C. *J. Sci. Instrum.*, 19, *pp.* 58–61, *April*, 1942.—An apparatus capable of transferring accurately successive predetermined volumes of a sterile medium to a bacterial culture flask is described. It consists of a glass syringe and valve system automatically operated by a compact series of levers attached to a power unit through a variable gear giving a wide range of interval between successive operations. An improved syringe holder is also described.

See Abstr. 1880 542.2 : 539.319

1961 542.2 : 621.313.14

An improved type of electrically driven high-speed laboratory centrifuge. PICKELS, E. G. *Rev. Sci. Instrum.*, 13, *pp.* 93–100, *March*, 1942.—[Abstr. 888 B (1942)].

1962 542.48

An improved sublimation apparatus. NELSON, O. A. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *p.* 153, *Feb.* 15, 1942.

1963 542.48

Molecular still heads. BAILEY, A. J. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 177–178, *Feb.* 15, 1942.

1964 542.48

Column packing and the separation of isotopes. THODE, H. G., AND WALKLING, F. O. *Canad. J. Res. A*, 20, *pp.* 61–68, *April*, 1942.—An expanded shale aggregate packing material for fractionating columns has been investigated.

1965 542.48 : 615.12

The high-vacuum still in medicine. HICKMAN, K. C. D. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 250–254, *March* 15, 1942.

1966 542.6

A sensitive check valve. LAUFFER, M. A. *Science*, 95, *pp.* 363–364, *April* 3, 1942.—Electrophoresis or diffusion experiments by methods involving the study of a boundary between solvent and solution requires ionic equilibrium between colloidal solution and solvent, and this has now been accomplished by means of a rocking dialyser. A well-built rocket with a reliable source of power, a small reservoir attached to one end of the table of the rocker, a larger reservoir to hold the bulk of the liquid, some rubber tubing and 2 check valves to render flow unidirectional, constitute the essential features of the set-up to obtain the desired circulation. A very simple and highly sensitive check valve is described. H. H. HO.

1967 542.61

Agitation. HIXSON, A. W., AND BAUM, S. J. *Industr. Engng Chem.*, 34, *pp.* 194–208, *Feb.*, 1942.—An equation for the power requirements of a series of dimensionally similar agitators is derived, and the experimental results are correlated with it. A standard turbine agitator design is established, and the effects of single variations from this design on power requirements are investigated.

1968 542.61

Continuous washing apparatus for solutions in inorganic solvents. LEROSEN, A. L. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *p.* 165, *Feb.* 15, 1942.

1969 542.67 = 3

On filtration research. BRIEGHEL-MÜLLER, A. *Kolloid Z.*, 93, *pp.* 297–318, *Dec.*, 1940, *and* 95, *pp.* 82–102, *April*, 1941.—[See Abstr. 1110 (1941)]. The relation between the average velocity of flow and the volume to be filtered is discussed. Various laboratory appliances and methods are described and illustrated. R. N.

1970 542.77

Pressure regulating and indicating apparatus for vacuum systems. FERGUSON, JR., B. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 164–165, *Feb.* 15, 1942.

See Abstr. 1918 545.37 : 541.182.63 : 541.135.5

CRYSTALLOGRAPHY

See Abstr. 1829 548 : 535.4 : 537.531

See Abstr. 1830 548 : 535.4 : 612 : 537.531

See Abstr. 1874 548 : 537.533.73 : 539.23

1971 548 : 539.32 : 539.434

Elasticity and creep of Pb single crystals. SWIFT, I. H., AND TYNDALL, E. P. T. *Phys. Rev.*, 61, *pp.* 359–364, *March* 1 *and* 15, 1942.—The rigidity modulus and Young's modulus of Pb single crystals have been measured by static methods as functions of crystal orientation. The elastic parameters are in agreement with previous values. The bending-torsion effect is large for certain orientations, and its effect upon the measurement of rigidity modulus by torsion has been studied. The elastic limit for Pb under longitudinal stress occurred when the resolved shear stress on the most favourably placed octahedral plane was 2×10^6 dynes/cm.^{2} Observations have been made of the transient creep under longitudinal stress. The creep strain velocity at any instant was $\propto$ the diff. betw. the final strain reached under that load and the strain present at the instant.

1972 548.73

The crystal structure of diphenylselenium dichloride. MCCULLOUGH, J. D., AND HAMBURGER, G. *J. Amer. Chem. Soc.*, 64, *pp.* 508–513, *March*, 1942.

1973 548.73

Structures of complex fluorides. Ammonium-hexafluosilicate–ammonium-fluoride $(NH_4)_2SiF_6 \cdot NH_4F$. HOARD, J. L., AND WILLIAMS, M. B. *J. Amer. Chem. Soc.*, 64, *pp.* 633–637, *March*, 1942.

GEOPHYSICS

1974 550

Geophysical Laboratory Report. ADAMS, L. H. *Carnegie Instn Yearb.*, 40, *pp.* 35–56, 1940–1941.

1975 550.372 : 551.594.221 : 621.316.933 = 3

Geo-electric constitution of the subsoil and lightning protection. FRITSCH, V. *Naturwissenschaften*, 29, *pp.* 397–403, *July* 4, 1941.—The importance of the geo-electric features of the subsoil in relation to the likelihood of lightning strokes in a specified area is stressed. The determination of the probability of

danger and the protective range of lightning conductors is discussed with the aid of diagrams. The establishment of test fields in open country is recommended; a field at Abroth is briefly described.

H. G. S.

1976 550.372 : 621.316.99 : 621.3.011.2

The depth dependence of earth conductivity upon surface potential data. KECK, W. G., AND COLBY, W. F. *J. Appl. Phys.*, 13, *pp.* 179–188, *March*, 1942.—[Abstr. 869 B (1942)].

1977 550.381

Department of Terrestrial Magnetism Report. FLEMING, J. A., AND GISH, O. H. *Carnegie Instn Yearb.*, 40, *pp.* 57–116, 1940–1941. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 45–52, *March*, 1942.

1978 550.384.3

International quiet and disturbed days for the first six months of 1941. JOHNSTON, H. F. *Terr. Magn. Atmos. Elect.*, 47, *p.* 81, *March*, 1942.

1979 550.385

Principal magnetic storms. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 85–90, *March*, 1942.

1980 550.389

Notes on isomagnetic charts. VI. Earth-air electric currents, and the mutual consistency of the *H* and *D* isomagnetic charts. CHAPMAN, S. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 1–13, *March*, 1942.—[See Abstr. 1778 (1941)]. Atmospheric-electric observations indicate that the electric currents crossing the Earth's surface are too weak to have an observable effect on the distribution of the geomagnetic field, which should therefore be derivable from a scalar potential. This question has been examined: By means of line-integrals of the horizontal magnetic intensity; by drawing magnetic parallels; by spherical harmonic analysis; and by calculating the vertical comp. of the *curl* of the field at particular points. The *curl* method is the most generally useful. A new formula is given for calculating the *curl* directly from the isomagnetic charts for *D* and *H*. The process is applied to the 1922 Admiralty charts.

1981 550.389

The new isogonic chart of the United States. KNAPP, D. G. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 53–62, *March*, 1942.—The discussion explains some of the factors affecting the production of isogonic charts, and presents a comprehensive plan, expected to promote uniform standards of treatment for future work. The scheme used for the chart for 1940 is outlined. The behaviour of secular change as reflected in the new chart is discussed.

1982 550.389.13

American *URSI* broadcasts of cosmic data, giving American magnetic character-figure, C_A, three-hour-range indices, *K*, and mean *K*-indices, K_A, for October to December, 1941, and summary for year 1941. JOHNSTON, H. F. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 67–74, *March*, 1942.

1983 550.389.13

Solar and magnetic data, October to December, 1941, Mount Wilson Observatory. NICHOLSON, S. B., AND MULDERS, E. S. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 81–82, *March*, 1942.

1984 550.43 : 531.787

Origin of underground carbon dioxide. GERMANN, F. E. E., AND AYRES, H. W. *J. Phys. Chem.*, 46, *pp.* 61–68, *Jan.*, 1942.—Of the many theories, that of thermal dissociation is studied, and it is shown that actual underground conditions may lead to results different from those obtained in the laboratory. Data obtained with natural oolitic limestone indicate that the CO_2 does not result from a hydrolitic reaction but from a chemical action with some impurity such as SiO_2 or Al_2O_3, and support the view that thermal decomposition of the colloidal substances underground in presence of water vapour can contribute largely to the observed yields.

N. M. B.

1985 551.244

Change in the heights of the monthly mean sea-level at Aburatubo and Hosozima. YAMAGUTI, S. *Bull. Earthq. Res. Inst. Tokyo*, 18, *pp.* 39–48, *March*, 1941.—A downward displacement of the earth's crust continued from the Great Earthquake of 1923 until the end of 1937, interrupted only by small vertical oscillations.

W. A. R.

1986 551.244

Secular changes in the heights of yearly mean sea-level at Japanese stations. MIYABE, N. *Bull. Earthq. Res. Inst., Tokyo*, 19, *pp.* 238–247, *June*, 1941.—Annual changes in mean sea-level are shown to depend largely on changes in the sea-water temperature.

W. A. R.

1987 551.311.1

Glacier thinning during deglaciation. I. Glacier regimens and ice movement within glaciers. DEMOREST, M. **II. Glacier thinning inferred from geologic data.** FLINT, R. F. *Amer. J. Sci.*, 240, *pp.* 29–66, *Jan., and pp.* 113–136, *Feb.*, 1942.—I. The mechanics of ice flow under various conditions are analysed, showing how variations in accumulation and ablation may affect the regimens of different sorts of glaciers. There are 4 types of movement, (1) extrusion flow, (2) obstructed extrusion flow, (3) obstructed gravity flow, and (4) gravity flow. The first 2 are pressure-controlled types, characteristic of glaciers lying on horizontal floors and having surfaces of slight slope. The second 2 are drainage-controlled types. Shear components of direct gravitative forces are principally responsible for movement. Thinning must accompany glacial recession, especially during late stages of deglaciation. II. This is supported by 3 lines of evidence: (1) Separation of parts of glaciers, (2) presence of stagnant ice, and (3) observed and measured thinning.

1988 551.417

Mean sea level and sand movement: a reply. SHEPARD, F. P., AND LAFOND, E. C. *Science*, 95, *pp.* 193–194, *Feb.* 20, 1942.—[See Abstr. 1167 (1942)].

See Abstr. 1864 551.462 : 539.163

1989 551.465

Sea waves: their growth and subsidence. UNNA, P. J. H. *Nature, Lond.*, 149, *pp.* 584–585, *May* 23, 1942.

1990 551.506.1

Preliminary report on tornadoes in the United States during 1941. MATTICE, W. A. *Mon. Weath. Rev. Wash.*, 69, *pp.* 358–359, *Dec.*, 1941.

1991 551.506.1

The weather of 1941 in the United States. MATTICE, W. A. *Mon. Weath. Rev., Wash.*, 69, *pp.* 360–362, *Dec.*, 1941.

1992 551.506.1

North Atlantic tropical disturbances of 1941. SUMNER, H. C. *Mon. Weath. Rev., Wash.*, 69, *p.* 363, *Dec.*, 1941.

1993 551.506.1

Typhoons and depressions over the Far East, October, 1941. DOUCETTE, B. F. *Mon. Weath. Rev., Wash.*, 69, *pp.* 363–364, *Dec.*, 1941.

1994 551.508.94 : 621.317.792

The point-discharge recorder—recording micro-ammeter. CANDLER, J. L. *Rep. Brit. Elect. Allied Industr. Res. Assoc. Ref. S/T* 30*a*. *J. Sci. Instrum.*, 19, *pp.* 75–78, *May*, 1942.—[Abstr. 916 B (1942)].

1995 551.510.535

The ionosphere at Huancayo, Peru, October to December, 1941. LEDIG, P. G., COILE, R. C., AND JONES, M. W. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 63–66, *March*, 1942.

1996 551.510.535

Critical frequencies and virtual heights of the ionosphere, observed by the National Bureau of Standards at Washington, D.C., October to December, 1941. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 83–84, *March*, 1942.

1997 551.510.535 : 523.78 : 621.396.812.5

Ionospheric measurements made during the total solar eclipse of 1940 October 1. HIGGS, A. J. *Mon. Not. Roy. Astr. Soc.*, 102, 1, *pp.* 24–34, 1942.—A description, with some discussion, of the ionospheric results obtained during the eclipse with automatic $P' - f$ equipment at Victoria West, S. Africa. The observations show that: The E region, qualitatively, behaved as expected. The radiation responsible for the production of region E was not being emitted uniformly from the Sun's disc, but was coming mainly from regions near patches of bright hydrogen. The F_1 region showed, roughly, the expected results, but this region is more complex than is generally supposed. There was an ultra-violet effect produced in region F_2, but no corpuscular effect. The density fell by about 25% to a min. about 30 min. after totality.

1998 551.510.535 : 621.396.812.5

Earth's magnetic field and actual heights in ionosphere. WELLS, H. W. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 75–79, *March*, 1942.

1999 551.521.1

Solar radiation and sunspot data for December, 1941. PAINE, I. *Mon. Weath. Rev., Wash.*, 69, *pp.* 380–383, *Dec.*, 1941.

See Abstr. 1814 551.57 : 536.7

2000 551.577.37

Rainfalls of 10 inches, or more, during 24 hours, in the United States. VISHER, S. S. *Mon. Weath. Rev., Wash.*, 69, *pp.* 353–356, *Dec.*, 1941.

2001 551.577.37

The record rainfalls of the world. *Mon. Weath. Rev., Wash.*, 69, *pp.* 356–357, *Dec.*, 1941.

2002 551.582

Meteorological and climatological data for December, 1941. *Mon. Weath. Rev., Wash.*, 69, *pp.* 364–380, *Dec.*, 1941.

2003 551.582.3

Climatological data. GRAY, R. W. *Climatol. Data, W. Indies*, 20, *pp.* 57–64, *Aug.*, 1940.

2004 551.582.3

Climatological data. GRAY, R. W. *Climatol. Data, W. Indies*, 21, *pp.* 33–40, *May*, 1941.

2005 551.594.12

The rate of ion-production at any height in the earth's atmosphere. CHAPMAN, S., AND MIAN, A. M. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 31–44, *March*, 1942.—The world-wide distribution of the rate of ion-production by monochromatic radiation, at any level in an atmosphere in which the density of the absorbing ionized constituent is an exponential function of the height, is represented by a series of Legendre functions. The coeff. may be calculated approx. and simply by means of index-sums. Numerical calculations and comparisons are made for the case when the curvature of the level layers in the atmosphere is neglected. It is shown how the curvature may be taken into account. The daily variation in the rate of ion-production at any level in any lat. at any season may be expressed in the form of a Fourier's series. For the equinoxes, when the Earth's curvature is neglected, the coeff. may be calculated in terms of integrals that can conveniently be represented approx. by index-sums. At other seasons and when the Earth's curvature is taken into account, the Fourier coeff. can probably be calculated most conveniently in terms of the Legendre coeff.

See Abstr. 1975 551.594.221 : 550.372 : 621.316.933

2006 551.594.25

Electricity of cloud and rain. SIMPSON, G. C. *Quart. J. Roy. Met. Soc.*, 68, *pp.* 1–34, *Jan.*, 1942.—Apparatus is described for measuring the electricity associated with relatively large quantities of rainfall and for measuring the charges on individual drops. Precipitation of all kinds is sometimes positively and sometimes negatively charged. The various theories which have been proposed to account for the origin of this electricity and its observed distribution in clouds are critically discussed. The negative charge in the upper part of clouds below 0°C. are explicable by the collision of ice particles; the positive charges in the rain region may be due to the breaking of drops or to the absorption of ions in an electric field; but no theory satisfactorily explains the positive charge invariably found on steady rain. A. HU.

2007 551.594.5

Auroras observed at the Blue Hill Observatory, 1885–1940. STETSON, H. T., AND BROOKS, C. F. *Terr. Magn. Atmos. Elect.*, 43, *pp.* 21–29, *March*, 1942.

VARIOUS SUBJECTS

See Abstr. 1830	612 : 535.4 : 548 : 537.531
See Abstr. 1965	615.12 : 542.48
See Abstr. 1890	629.13 : 539.5
See Abstr. 1933	669.22 : 541.182.8
See Abstr. 1777	77.02 : 535.33
See Abstr. 1801	771.35 : 535.81
See Abstr. 1809	9 : 536.6.081